Lynn

Serial #
81001208
240V FLA 15.5
3 1/2 HP

S-20A SERIES II

2001, rev c

THANK YOU,

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

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

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

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

Thank-you.

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HYD·MECH
The Rock Solid Solution

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HYD·MECH

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SECTION 1, INSTALLATION

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

SAFETY PRECAUTIONS

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

POWER HOOK-UPS AND REPAIRS SHOULD BE ATTEMPTED ONLY BY QUALIFIED TRADESMEN.

THE SAW SHOULD BE LOCATED IN AN AREA WITH SUFFICIENT ROOM TO SAFELY LOAD STOCK INTO THE SAW. SECURE THE SAW TO THE FLOOR.

THE AREA AROUND THE SAW SHOULD BE MAINTAINED IN A CLEAN AND TIDY CONDITION TO AVOID OBSTACLES OPERATORS COULD TRIP OVER.

THE S-20A SERIES II SHOULD ONLY BE OPERATED ACCORDING TO THE SPECIFICATIONS OF THE SAW. AVOID UNSAFE USAGE PRACTICES.

IF AT ANY TIME THE SAW DOES NOT APPEAR TO BE OPERATING PROPERLY IT SHOULD BE STOPPED IMMEDIATELY AND REPAIRED.

OPERATOR : THE SAW SHOULD NEVER BE OPERATED UNLESS ALL GUARDS AND DOORS ARE IN PLACE AND CLOSED.

OPERATOR : KEEP A SAFE DISTANCE FROM ALL MOVING PARTS - ESPECIALLY THE BLADE AND VISES.

OPERATOR : LOOSE CLOTHING AND GLOVES SHOULD NEVER BE WORN WHILE OPERATING THE SAW. COVER LONG HAIR.

OPERATOR : STOCK SHOULD NOT BE LOADED ONTO THE SAW IF THE BLADE IS RUNNING.

OPERATOR : LONG AND HEAVY STOCK SHOULD ALWAYS BE PROPERLY SUPPORTED IN FRONT OF AND BEHIND THE SAW.

OPERATOR : NEVER ATTEMPT TO DISLODGE OR MOVE STOCK WHILE THE BLADE IS MOVING. TAKE THE TIME TO STOP THE SAW BLADE, REMOVE OBSTRUCTIONS, AND RESTART BLADE.

OPERATOR: MUST WEAR EYE PROTECTION.

OPERATOR: MAINTAIN PROPER ADJUSTMENT OF BLADE TENSION, BLADE GUIDES, AND BEARINGS

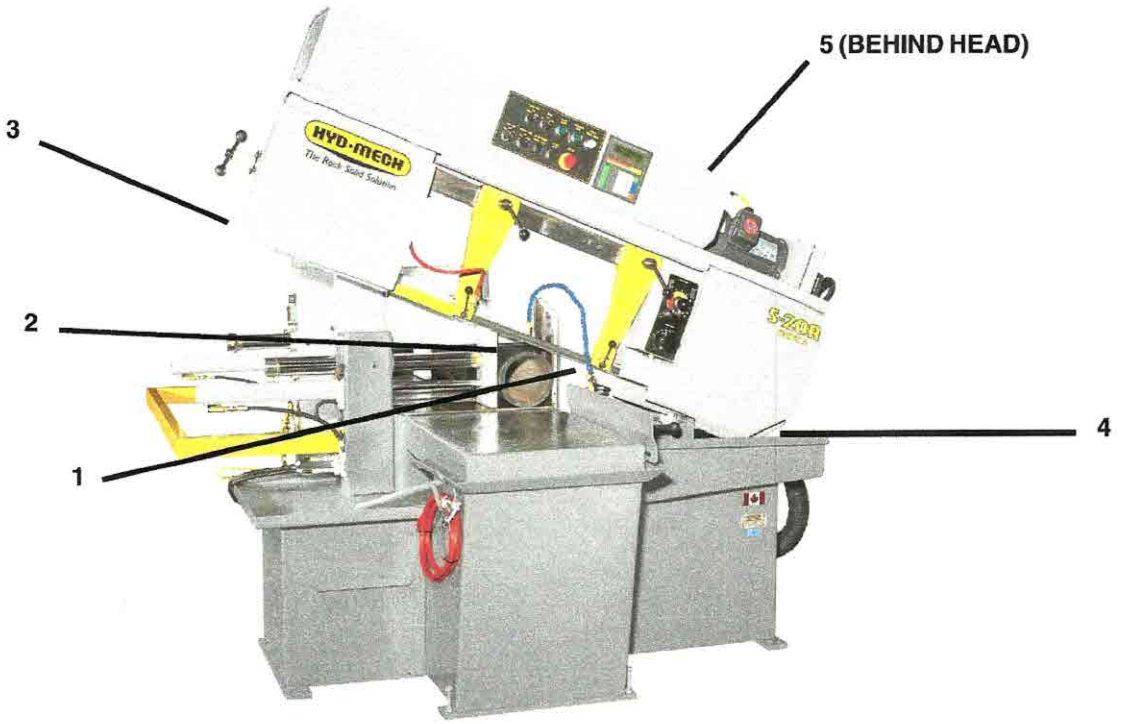
OPERATOR: HOLD WORKPIECE FIRMLY AGAINST TABLE.

OPERATOR: DO NOT REMOVE JAMMED CUTOFF PIECES UNTIL BLADE HAS STOPPED.

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

OPERATOR SAFETY- VISUAL INSPECTION

The operator should always make a visual inspection of the saw before operating. The following areas should be checked.



Safety Inspection Points for Operators

1.	BLADE	-	KEEP AWAY FROM MOVING BLADE!
2.	VISE	-	NEVER LOAD STOCK WITH BLADE MOVING!
3.	HEAD	-	WATCH FOR HEAD DESCENDING TO TABLE!
4.	PIVOT	-	CHECK FOR HEAD MOVEMENT BLOCKAGE!
5.	SHUTTLE	-	STAY CLEAR OF MOVING SHUTTLE & VISE!

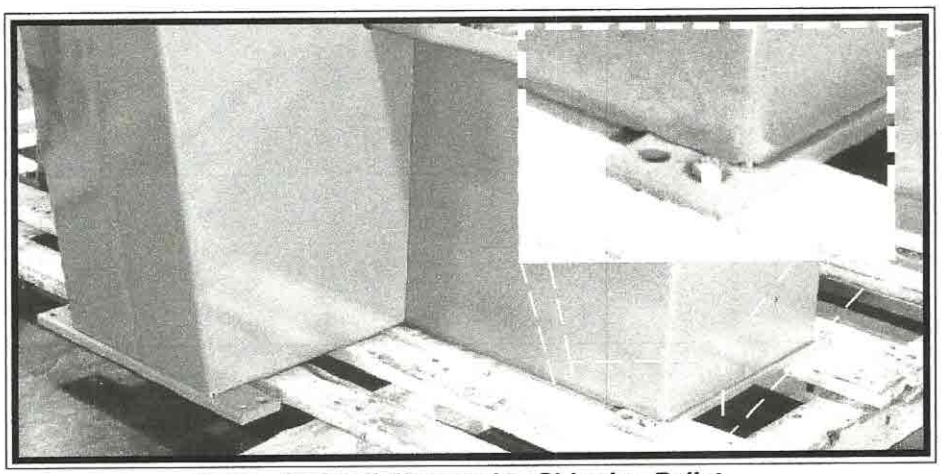
LIFTING THE S-20A SERIES II

The S-20A Series II is shipped with a shipping pallet attached to the saw. When lifting the pallet with a forklift truck make sure that the load is firmly balanced. The following photo shows a lift truck lifting the saw and pallet from the correct side. The pallet length dimension is 120". Minimum fork length of 72" is recommended to safely lift the pallet.

Lifting the S-20A Series II with a Forklift Truck

WRAPPED FOR SHIPPING

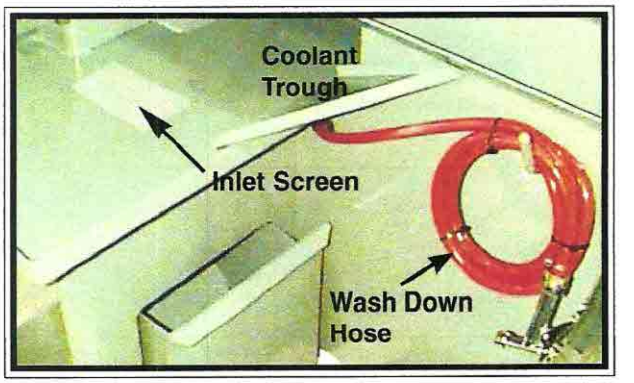
The S-20A Series II is wrapped for shipping from our plant. Remove the wrapping from around the saw. Complete the inspection for signs of shipping damage. Undo the bolts that hold the saw to the pallet. Retain these bolts to use for levelling. The following photo illustrates the floor mounting plates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



S-20A Series II Mounted to Shipping Pallet

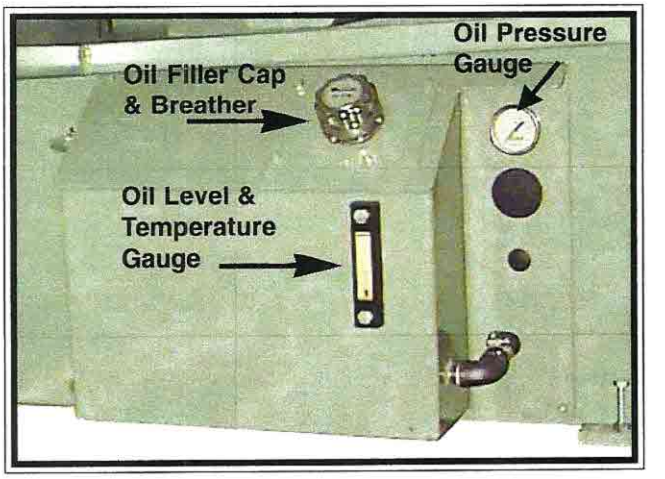
LEVELLING THE SAW

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



HYDRAULIC OIL and TANK

The S-20A Series II is supplied with a Texaco 46 hydraulic oil in the oil tank. Substitutes should be a 46 grade of hydraulic oil. See Section 3 for instructions on changing brands of oil. The oil tank should be topped up to the top line on the gauge . The oil pressure gauge indicates system pressure.



CUTTING FLUID

The S-20A Series II uses a pump and reservoir to circulate the necessary cutting fluid to the blade for maximum blade life. Your saw blade supplier will be able to provide information to the cutting fluid products that are available for your needs. No cutting fluid (coolant) is supplied with the machine. There are two types of coolant available:

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

SPEED ADJUSTOR INSTALLATION

The speed adjustor is packaged seperately for shipping purposes and must be installed prior to connecting the power supply. Failure to do so will cause a safety hazard. Refer to page 6.2 for installation instructions.

POWER WIRING CONNECTIONS

When the machine has been anchored and levelled the power hook-up is the last installation step. In order to provide safe operation and to prevent potential damage to the machine, only qualified personnel should make the electrical connections. If the hydraulics do not register an immediate pressure rise,

- SHUT THE HYDRAULICS OFF -

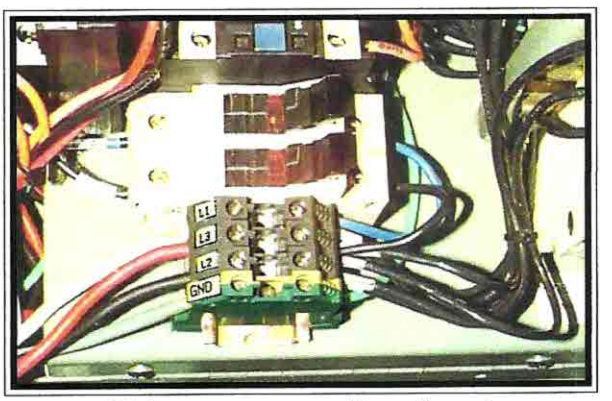
and change the phase order. As supplied your new S-20A Series II is set to run on three phase voltage. The supply voltage of the machine is shown on the serial plate attached to the front of the machine. Connection from the Main supply is made to L1, L2, L3, and ground terminals in the electrical control box as shown below.

If equiped with the PLC option, these connections are made in the power disconnect switch as shown in the photographs on the next page.

Supply conductors should be rated for the current supplied and should be protected by time delay fusing rated for the amperage stated on the machine serial plate.

CHECK FOR: -Signs of damage to the electrical cables from shipping or installation.
-Correct phase order - The blade should be running counterclockwise.
(If the blade direction is wrong, any two lines should be reversed to correct)

L1
L2
L3
GROUND



Main power connections found inside the control box.

The power cable should be routed through the two holes found at the left end of the control box beside the motor power cable. A suitable strain relief should be used.

POWER WIRING CONNECTIONS (for S-20A with the PLC option)

After the machine is levelled 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 is 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 counter clockwise direction. If the hydraulics do not register an immediate pressure rise,

- SHUT THE POWER OFF -

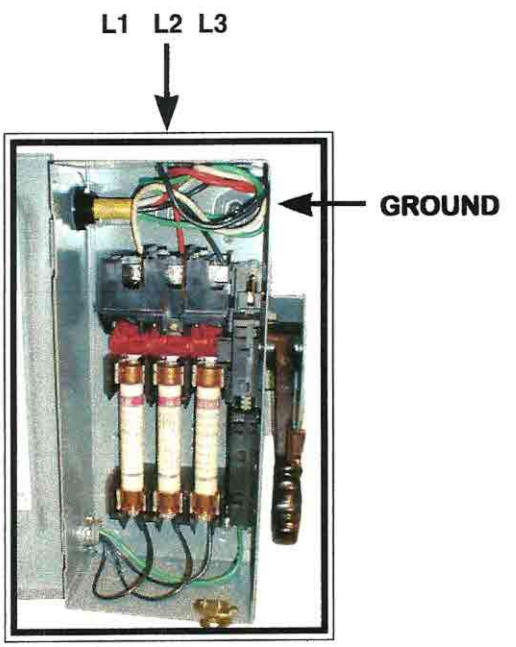
And change the phase order. As supplied, the machine is set to run on the three phase voltage as indicated on the serial plate and voltage label. Power connection to the machine is made to the main disconnect switch and the Ll, L2, L3 and Ground terminals. The disconnect switch box is located on right side of the infeed.

To gain access to the disconnect box, follow these steps:

1) Ensure the switch is in the OFF position and power is diconnected.
2) Push the lockout tab to the right and pull the door open.

To close the door properly, reverse the above steps.

Disconnect box found on the rear of the main base at the drive end.



Main Power Connections.

SECTION 2, OPERATING INSTRUCTIONS

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

BLADE BASICS

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

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

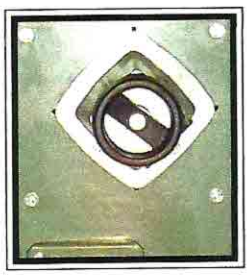
After "break-in", the following six points must be closely monitored to ensure long blade life:

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

VARIABLE SPEED CONTROL

Blade speed can be adjusted infinitely between 75 to 350 SFM (Surface Feet/Minute) (23 to 106 m/min). Adjustment should be made only when the blade is running. Clockwise rotation of the knob increases blade speed while counter clockwise rotation decreases blade speed.

It is recommended to occasionally run the speed adjustor through it's full range. This will help in maintaining the pulley system. It is also recommended that if the same speed is used for long periods, then a minor adjustment should be made,eg; 200 SFM should be run at 190 or 210 SFM for part of the time. This will help in reducing wear grooves and keep the speed adjustment smooth.



Speed adjuster

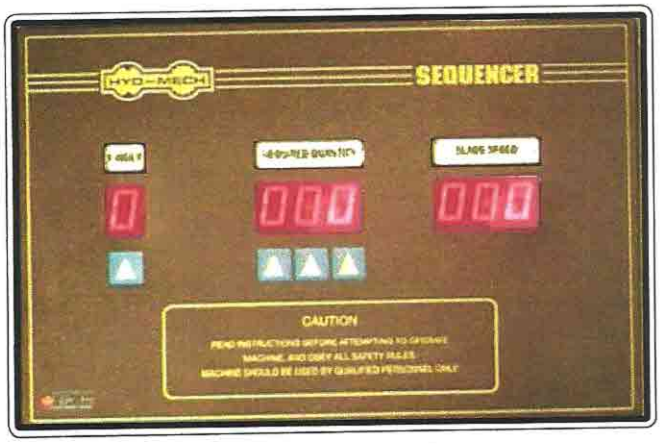
OPERATOR CONTROL CONSOLE

The operator control console provides the operator with all the controls necessary to operate the saw after the cutting angle has been set and the stock has been loaded and secured. All of the electrical control functions of the S-20A Series II or S-23A saw are provided to the operator from the control console which incorporates the manual control switches, the Sequencer controller, and the Head Up Limit setting knob. The hydraulic functions of the S-20A Series II / S-23A are controlled from the Hydraulic Feed Control unit. This unit is covered in detail later in this section, see "Hydraulic Feed Control" on page 25.

The manual control switches allow the operator to raise and lower the Head of the saw, turn the blade on and off, open and close the vises, move the shuttle, and turn the coolant supply on and off. The control switches are described by function on the following three pages.

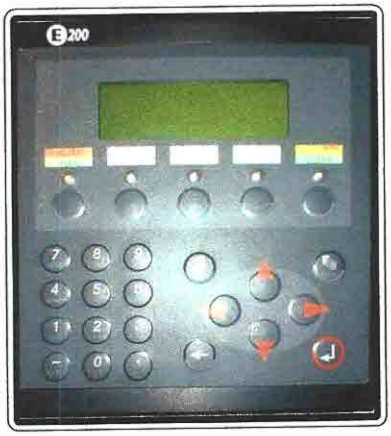
Manual Control Switches for Sequencer

The Sequencer controller provides the operator with the ability to operate the saw in automatic mode. Starting on page 11, this controller is described in detail.



Sequencer Controller

An optional PLC controller can be supplied for your S Series saw which has fully automatic capabilities. Starting on page 14, this controller is described in detail.



E200 PLC interface.

Manual Controls

TOP ROW

PLC SWITCH The PLC On/Off switch controls the power supply to the Sequencer controller. When the switch is ON, the controller is active for display in Manual Mode, and to set the saw operation cycles in Automatic Mode.

FIXED VISE SWITCH This switch has three positions, OPEN, HOLD, and CLOSE. It is disabled when the SEQUENCER is in AUTO. The FIXED VISE switch is active while the MODE switch is in MANUAL or NEUTRAL

OPEN: Opens the vise as long as it is held at OPEN.
HOLD: Holds the vise jaw in it's current position, however a large force will cause some creeping over time.
CLOSE: Closes the vise.

INDEX VISE (FORWARD) BUTTON The INDEX VISE button is a two position push button. When partially depressed, the INDEX VISE will move forward slowly. When pressed in fully, the INDEX VISE will move at a fast rate.

HEAD POSITION SWITCH The HEAD switch is a three position switch and is active only when the PLC switch is in MANUAL. When the switch is set to HOLD the Head will remain stationary. In the UP position the Head will rise until the UPPER LIMIT is met. In the DOWN position the Head will descend only if the Feed Rate control is set to a value greater than zero.

FEED FORCE PUSH-BUTTON The FEED FORCE switch is used ONLY for the hydraulic setup. Service personnel should contact the Hyd·Mech dealer for information and procedures.

COOLANT SWITCH Has three positions WASH, OFF and ON.

ON: The coolant flows only when the Head descends.
WASH: Coolant flows any time the machine is under power, permitting wash-down with hand line without running machine.
OFF: No coolant flow.

BOTTOM ROW

CONTROL FUSE HOLDER The Control fuse is located in the fuse holder and is accessible by depressing the holder in and turning. The control fuse is used for protection of the control circuitry which operates at 120 volts. The fuse is rated for 5 Amps maximum at 250 volts.

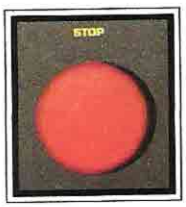
INDEX VISE SWITCH This switch has three positions, OPEN, HOLD, and CLOSE. It is disabled when the SEQUENCER is in AUTO. The INDEX VISE switch is active while the PLC switch is in MANUAL or NEUTRAL

OPEN: Opens the vise as long as it is held at OPEN.
HOLD: Holds the vise jaw in it's current position, however a large force will cause some creeping over time.
CLOSE: Closes the vise.

INDEX VISE (REVERSE) BUTTON The INDEX VISE button is a two position push button. When partially depressed, the INDEX VISE will move away from the HEAD slowly. When pressed in fully, the INDEX VISE will move at a fast rate.

MODE SWITCH The MODE switch is a three position switch.
The NEUTRAL position deactivates all other switches except for the Fixed and INDEX Vise switches.
The MANUAL position allows for manual control of the saw with all switches active.
The AUTO position is used when the Sequencer controls cutting. Caution should be used when switching to AUTO mode as the cycle will run *WITHOUT* the blade running.

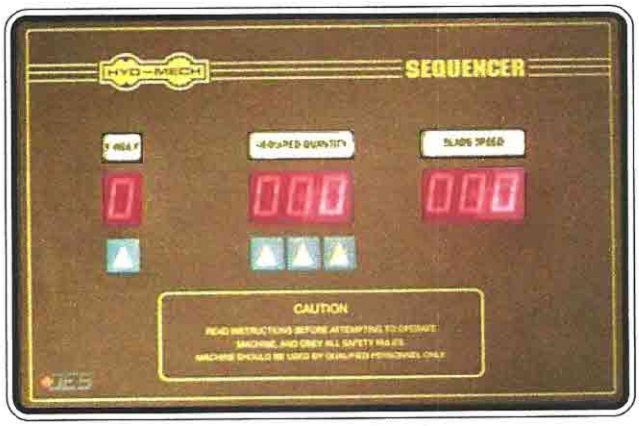
HYDRAULIC START PUSH-BUTTON The HYDRAULIC START button is an illuminated (green) PUSH-BUTTON switch which activates the Hydraulic system. This switch must be pressed and the hydraulic pump must start before the vises and head will respond to operator control.



STOP PUSH-BUTTON The STOP push-button is a safety switch which will stop all saw functions. The electrical control circuitry will be inactive with the exception of the SEQUENCER as it will be ready for the next job but the hydraulic system will shut off when this switch is depressed.

BLADE SWITCH The blade switch is used by the operator to start and stop the saw blade in all modes. In all cases, the HYDRAULIC system must be operating. The SEQUENCER will run a cycle *WITHOUT* the blade running.

SEQUENCER OPERATION GUIDE



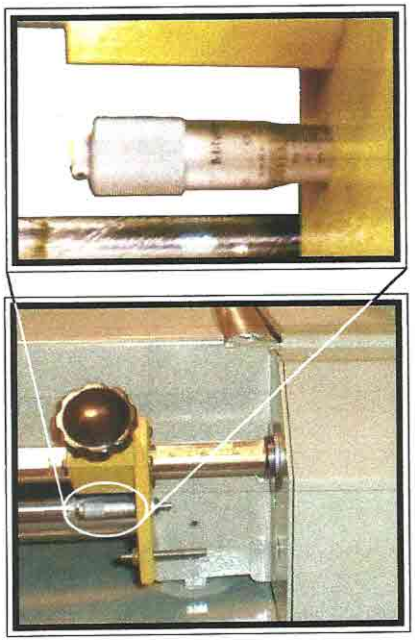
The Sequencer interface.

The Hyd·Mech Sequencer controller provides automatic operation of the S-20A Series II or S-23A. The operator needs only to set the required length measurement using the adjusting block and scale. For longer lengths than 29", the SEQUENCER can provide multi-indexes of the shuttle by setting the single digit #INDEX function.

The required number of cuts is set using the 3 digit REQUIRED QUANTITY function. In AUTOMATIC mode, the S-20A Series II / S-23A will cut the required number of pieces and then the saw will shut off.

In either AUTOMATIC or MANUAL mode, the BLADE SPEED function displays the current blade speed while the blade is running.

NOTE; For the Sequencer to read the correct position of the shuttle, the micrometer on the length control assembly (on the side of the infeed conveyor shown) must be set to .250". For additional information about length controls, see "Shuttle Length Controls" later in this section (Mechanical Controls).



Sequencer control and micrometer.

ORDER OF OPERATION

1. With the Mode Switch in the Manual or Neutral position, turn the Sequencer "On" with the PLC switch.

Do not press any of the keys on the Sequencer Display face as the PLC switch is turned on.

The displays will light, the Sequencer will do a brief self test and within seconds be ready for operator input. For manual operation the blade speed will be displayed with the blade running.

2. Set the required piece length. If the length is less than 29", set the required length (with the S-20A length control adjusting block which slides along the ruler assembly) + blade kerf (kerf increases with angle being cut).

3. If the length required is greater than 29", then the # INDEX function can be used to advance the required length of stock before the cut. For example if a 75" piece length is required then, as 75" is not divisible by 29" without a remainder, select a divisor which can provide a repeat length less than 29". In this case 75" divided by 3 gives a length setting required of 25". The # INDEX can then be set with the value of 3 by pressing the entering key below the display. The display counts up from 1 to 9 as the entering key is pressed.

NOTE: Blade kerf + Desired length = Total part length
Total Length x # of Shuttles = Raw Stock Length

ENTERING KEY

4. Set the required quantity of cuts by entering the number with the entering keys. The three digits permit up to 999 pieces to be cut before the cycle is completed. As each key is pressed the display immediately above it will count from 1 to 9.

5. In MANUAL mode, open the shuttle vise and move it fully forward to the home position, leaving the vise open in this position.

6. Turn the Mode switch to the Automatic position. The Hydraulic motor will stop, and the SEQUENCER will show the message "P a u S E d".

7. Press the Hydraulics Start button and the Automatic cycle will start. The BLADE must also be started. The #INDEX display will count the shuttles down to "0" for each cycle and the REQUIRED QUANTITY will also count down with the completion of each cut.

ENTERING KEYS

8. When the job is completed, the HEAD will rise to it's set limit and the saw will shut down with the exception of the SEQUENCER as it will be ready for the next job to be entered.

IMPORTANT NOTE:

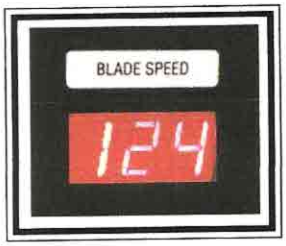
If the job cycle is interrupted at any time by switching from AUTO to MANUAL mode, the SEQUENCER will not function until the AUTO mode is started again.

If the shuttle or any of the other functions are moved, it is imperative that they be returned to their original positions at the time of interruption before continuing with the cycle.

Failure to do this may result in incorrect length being cut.

BLADE SPEED INDICATOR

The running blade speed is displayed on the SEQUENCER display in either the Manual or AUTOMATIC mode. The units measurement is factory set in Surface Feet Per Minute or Metric. This setting can be changed by a skilled operator. Contact Hyd-Mech Saws for assistance with this change.



SEQUENCER PARAMETER SETUP

The Sequencer program is factory set with settings that allow the saw to be accurately configured. These settings are available to be changed for different machine operation configurations.

To access the Parameter Settings:

Turn the Sequencer OFF with the PLC switch.
Hold down the entering key below the #INDEX.
Turn the Sequencer ON with the PLC switch.

The displays will light, a brief program number message will appear for a brief instant and then all three indicators will be displaying zeros on the Sequencer face.

Hold down key + Turn switch to ON

---- Continued ----

Parameter Options

0: Machine

1: Vise Close Delay Time

2: Blade Wheel Circumference

3: Blade Wheel Pulses/Revolution

1: Vise Open Time

Parameter Options Settings

The #INDEX display with the single digit is used to show which option is active and can be set. The Options are:

OPTION 0 : With option 0 there are four machine characteristics settings. This function is the active option default when the Parameter Setup is entered by holding down the #INDEX key as the PLC switch is turned ON.

SETTING: 000
This is the default setting for normal S-20A machine operation of the vises, shuttle and cutting head.

SETTING: 001
This setting changes the normal operation to allow the Shuttle Vise to remain closed and for the Shuttle to remain in the forward position while the saw is cutting. This option is useful to hold stock such as bundles until the cut is completed.

SETTING: 002
This setting changes the blade speed indicator to display the blade speed in Metric measurement.

SETTING: 003
This setting combines 001 and 002 settings to allow both to be operational. With 003 the blade speed will be displayed in Metric, the Shuttle will stay forward and the Shuttle vise will remain closed until the cut is complete.

OPTION 1 :
With option 1 the vice close delay interval (time from start of close to start of next operation) can be adjusted. For changes of this setting contact Hyd·Mech Saws as to the possible ramifications.

OPTION 2 :
With option 2 the Blade wheel circumference measured in feet, times a factor of ten (Examples S-20A, 4.2 feet x 10 = 42, S-23A, 5.0 feet x 10 = 50), is entered into the program. This value is used to calculate and display the blade speed.

OPTION 3 :
With option 3 the setting value is the number of pulses sent by the blade speed proximity sensor to the Sequencer for each revolution of the blade wheel. The setting for the S-20A is 240 pulses per revolution.

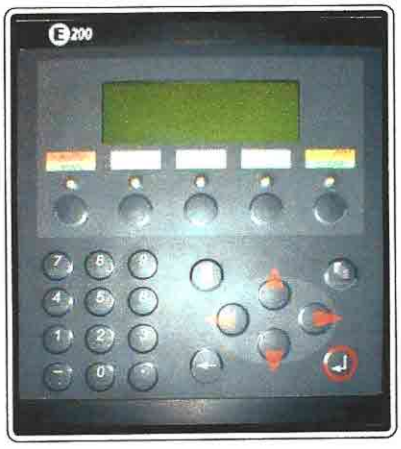
OPTION 4 :
With option 4 the vise open time can be adjusted. For changes of this setting contact Hyd·Mech Saws as to the possible ramifications.

HYD·MECH

OPTIONAL PLC 100 OPERATION GUIDE

The PLC controller provides the operator with the ability to operate the saw in automatic mode. Starting on page 16, this controller is described in detail. Topics covered include Operation, Parameter Setup, and examples.

Manual Control Switches for PLC 100



E200 PLC Interface.

MANUAL CONTROLS for PLC OPTION

TOP ROW

FRONT VISE SWITCH This switch has three positions, OPEN, HOLD and CLOSE. This switch is disabled when the PLC is in AUTO.

OPEN: Opens the vise as long as it is held at OPEN.

HOLD: Holds the vise jaw in it's current position, however a large force will cause some creeping over time.

CLOSE: Closes the vise. The PLC will change to SINGLE CUT MODE while vise is closed in MANUAL MODE.

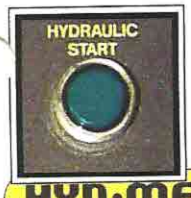
HEAD POSITION SWITCH The Head switch is a three position switch, UP, HOLD and DOWN.

UP: The head will rise until the head up limit switch is tripped.

HOLD: The head will remain in it's current position.

DOWN: The head will descend at whatever rate is set on the positive down feed control until it has reached the table.

BLADE START BUTTON The blade start button is a green illuminated push button. It's only purpose is to start the blade and becomes illuminated when the blade is running.



HYDRAULIC START BUTTON The HYDRAULIC START switch is a green illuminated push-button which activates the Hydraulic and control systems. The button must be held in for two seconds for the PLC to be activated. All controls are disabled until the button is illuminated.

CYCLE START BUTTON The Cycle Start button is a white illuminated push button which will begin a cut cycle in the PLC Auto or Manual operations.

BOTTOM ROW

COOLANT This switch has three positions WASH, OFF, and ON.

WASH: Coolant flows any time the machine is under power, permitting wash down with spray nozzle without running machine.

OFF: No coolant flow.

ON: The coolant flows only when the blade is running **OR** when the blade is running and the head is descending. This is selectable via the PLC parameters.

SHUTTLE VISE SWITCH This switch has three positions, OPEN, HOLD and CLOSE. This switch is disabled when the PLC is in AUTO.

OPEN: Opens the vise as long as it is held at OPEN.

HOLD: Holds the vise jaw in it's current position, however a large force will cause some creeping over time.

CLOSE: Closes the vise.

BLADE SPEED Not used on this machine. Blade speed is controlled by use of the adjuster on the drive assembly.

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

STOP BUTTON This button will shut down the entire machine at any time. This push button is latched so it must be pulled out to operate the machine.

PLC 100 CONTROL SYSTEM

NOTE: This instruction manual is applicable to the S-20A, S-23A, and H-10 equipped with a MITSUBISHI PLC manufactured after and including the following serial numbers:

Machine Model	Serial #
S-20A	80801168 (excluding 80901180)
S-23A	XA0801180

E200 operator interface.

OPERATION OVERVIEW

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

In manual mode, all functions can be operated by using a combination of selector switches on the control console and the PLC function buttons. Also the operator has the ability to execute a single cut utilizing a preprogrammed "Single Part Cycle".

In automatic mode, the PLC has the capacity to program and store 99 jobs. Designated job numbers can be programmed for quantity required (maximum of 999 pieces) and lengths from 0" to 220" (5588mm).

Jobs can be run individually or in a QUEUE which allows a maximum of 5 jobs to run consecutively and the queue can be repeated automatically as well.

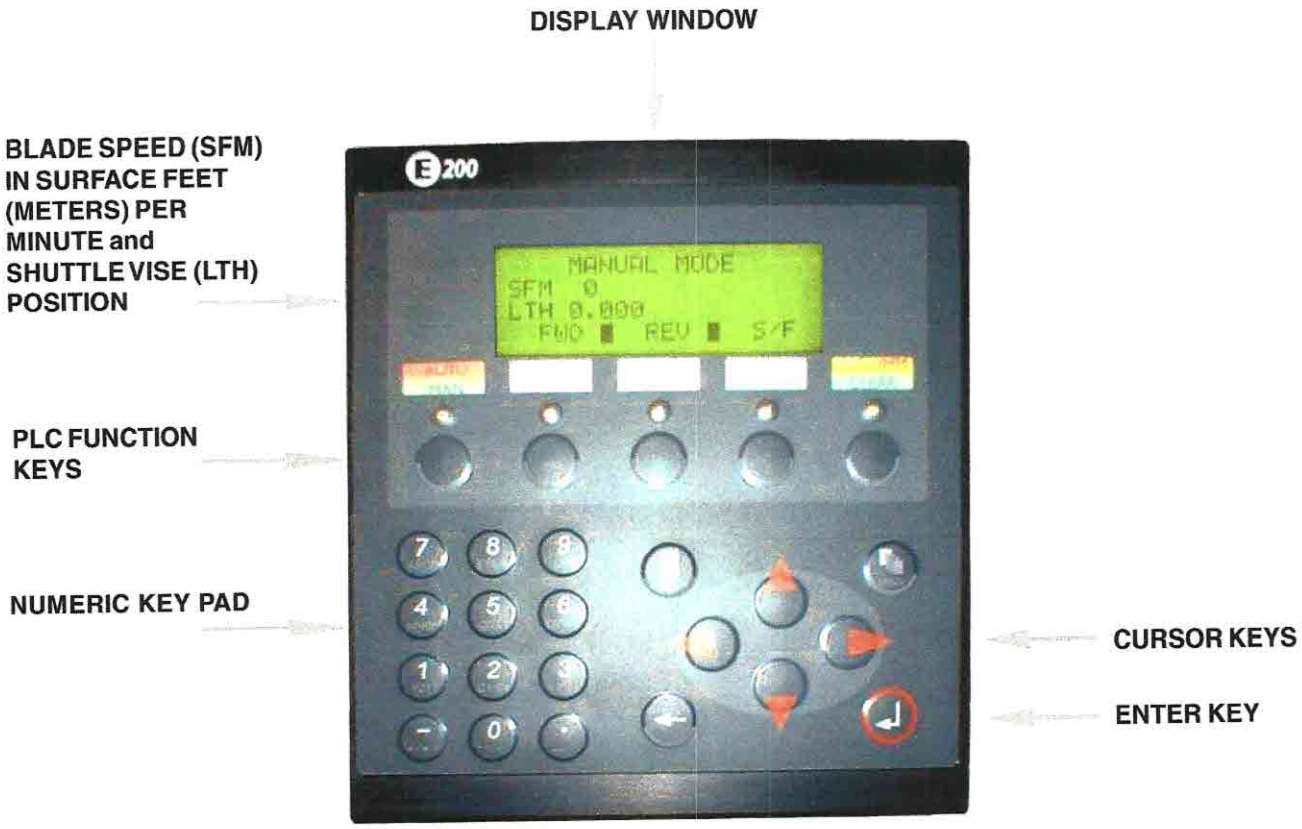
All machine operators should be familiar with the entire operation instructions prior to operating the machine.

NOTE: If an emergency situation arises during any operation, use the large red mushroom "STOP" button located on the control panel to shut down the machine. To operate the machine, the "STOP" button must be pulled out.

ACTIVATING THE PLC

Position the head, fixed vise, and shuttle vise switches to the **NEUTRAL** (center) positions. If any of these switches are not in the **NEUTRAL** position, the hydraulics will not start. The PLC control will become active when the **HYDRAULIC START** button is depressed and "held in" momentarily. First, the HMI and PLC's current revision number, 2100 1.0, will be shown on the display window and finally the **MANUAL MODE** display window will appear as shown below. The **AUTO/MAN** green indicator light will be on and all **MANUAL** controls are enabled. The **"LTH"** value (shuttle vise position) will always display zero at start up. The **"LTH"** value can be reset or cleared at any time in **MANUAL** mode by pressing the **CLEAR** function button.

PLC CONTROL PANEL



FUNCTION KEY DESCRIPTIONS

If a red indicator light above a function button is illuminated, it means that the function printed in red at the top of the button is enabled. No light indicates the function printed in black at the bottom of the function button is enabled.

The following are the function keys for AUTO and MAN modes:

AUTO / MAN MODE

- This key will toggle between MAN and AUTO modes. Auto mode cannot be accessed unless the front vise is closed.
- Also used to stop an automatic job in progress by switching to MANUAL mode.

UNLABELLED

- The function of theses keys are displayed directly above them. The function will change as the PLC is switched from one mode to another and as process of each mode is changed.

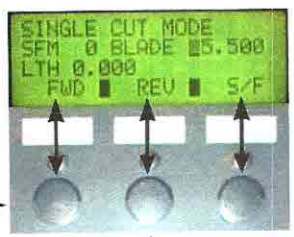
INCH/MM / CLEAR

- While depressed momentarily, it resets the displayed length value to zero. If held depressed for a few seconds, the displayed length will toggle between millimeters and inches and the blade speed in either surface feet per minute or meters per minute. It becomes disabled once any cycle is initiated.

MANUAL MODE FUNCTION KEY DESCRIPTIONS

While in manual mode, the display will show the current function of the unlabelled key. They are shown below.

FWD : FORWARD - This key will advance the shuttle vise toward the head (home position). If pressed simultaneously with the **REV** key, (the front vise must be closed and a password is required) the parameters will be displayed.



S/F : SLOW / FAST - This key will toggle between slow and fast shuttle speed.

REV : REVERSE - This key will retract the shuttle vise away from the head (home position). If pressed simultaneously with the **FWD** key, (the front vise must be closed and a password is required) the parameters will be displayed.

SINGLE PART CYCLE OPERATION

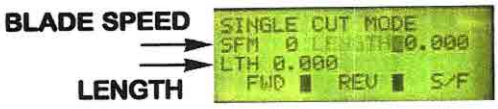
In MAN mode, the PLC allows the operator to initiate a "Single Part Cycle " to cut one piece at a desired length. To accomplish this, follow the procedure below.

1) A trim cut should be made before initiating the "Single Part Cycle " operation.

2) Make sure the front vise switch is in the closed position and set the head up limit switch. The AUTO/MAN indicator light will flash alternately green and red.

3) Make sure the head is set so that the blade is above the material and the head selector switch is in the HOLD position.

4) The cursor will be flashing at the LENGTH position. Key in the desired value from 0" to 220" and press ↵. If the value is incorrect, re-enter the value and press ↵ again.



5) If the blade is not running, you will be prompted by the word "BLADE" flashing on the display window. Start the blade and adjust the blade speed as required.

6) When the blade is started, the word "BLADE" will change to the word "CYCLE" flashing on the display window to begin the cut. Press **CYCLE START** and the cycle will begin.

7) When the start button is pressed, the shuttle vise will move to the forward home position before executing the length movement. The head will descend and make the cut.

8) When the cut is completed, the head will rise to the head up limit switch, the blade will stop and the display window will reset for the next cut.

9) To cut another piece, repeat steps 2 through 6.

NOTES:

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

2) To cut multiple pieces, switch to AUTO MODE and follow the automatic procedures.

NOTE: Whenever a new job or new material is being loaded for production, the head up limit switch should be properly set (ref pg. 23) to clear the material, material positioned for a trim cut and the front vise closed (in "MANUAL MODE").

AUTOMATIC OPERATION

When the AUTO/MAN button is pressed, the red indicator light above it will come on, and the blade will stop if it has been running. The screen will change to the JOB display window as shown below and be ready for editing or starting a new job. All manual functions will be disabled.

JOB DISPLAY WINDOW

PROCEDURE FOR EDITING OR STARTING A NEW JOB IN AUTO MODE

1) In AUTO mode, key in a job number from 0 to 99 and press ↵ If the job number has previously been programmed, the REQUIRED QUANTITY (RQ), LENGTH (LTH) and QUANTITY (CT) will be displayed. The values displayed can be edited by pressing ENTER after each new value, and the job will be stored in memory with the new values. To navigate through the values, use the CURSOR keys.

2) After the values are entered, press the **CYCLE START** button, the switch will illuminate, the display window will prompt you to start the blade for a trim cut (if the "Trim Cut" parameter has been selected).

CAUTION; If the head is in it's full down position it will rise to the head up limit so that no damage to the blade will occur.

3) After starting the blade, the head will descend for the cut and the machine will complete the required job.

JOB IN PROGRESS

4) At the completion of the job, the machine will shut down if "0" has been entered in the "POWER DWN TIMER" parameter or continue running for the specified time up to a maximum of 180 minutes.

NOTES:

1) The "CT" value is the accumulated total number of parts that have been cut from the JOB number since it was last reset. The machine will only cut the quantity which is the difference between REQUIRED QUANTITY and CUT QUANTITY. When REQUIRED QUANTITY equals CUT QUANTITY, the machine AUTO CYCLE will stop and you will be unable to restart the same job until the "CUT QUANTITY" value has been reset.

2) The AUTO cycle may exited and stopped at any time by pressing the AUTO MAN key.

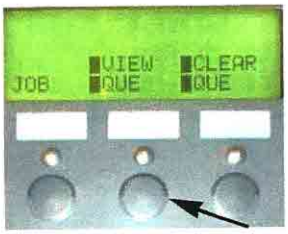
NOTE: Before entering "AUTO MODE" and working with a "QUEUE", follow the same procedures outlined on the previous page for "AUTOMATIC OPERATION" with regards to setting up for an initial trim cut.

WORKING WITH A QUEUE

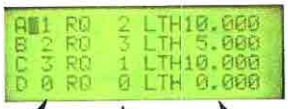
The purpose of a QUEUE is to allow the operator to run several jobs (max of 5) in series if they are of the same material and shape.

In AUTO mode, press the key below the word "QUE" on the display and the display window will appear as shown.

If you choose to VIEW the QUEUE, press the key below the words "VIEW QUE" on the display. The display window will show the jobs in the current QUEUE. Four jobs at a time are shown.

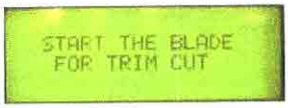


First Job →

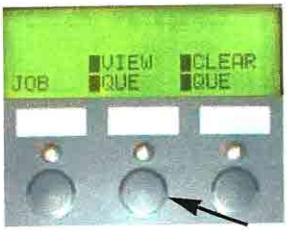


Programmed Job Number | **Quantity To Cut** | **Length To Cut**

Use the CURSOR buttons to view all the jobs. To run the QUEUE as it is displayed (jobs may be edited in this mode), press the CYCLE START button on the control panel. The screen will now prompt you to start the blade for a trim cut.



If you choose to Edit the QUEUE, press the key below the words "CLEAR QUE" on the display. This will clear any jobs that are in the QUEUE and the display window will show an empty Queue. Jobs may be entered and edited in this mode.



To fill the QUEUE, follow these two steps.

1) Key in a job number and press ENTER. If that job number has previously been programmed, it's values will be displayed. The cursor will move to the next position in the QUEUE. Up to five jobs may be in the QUEUE at any time. The job values can be edited in this mode.

2) When the desired jobs have been entered, you may press the CYCLE START button on the control panel to execute the jobs in the QUEUE. (Follow the same procedures to initiate a cycle as in "AUTOMATIC OPERATION")

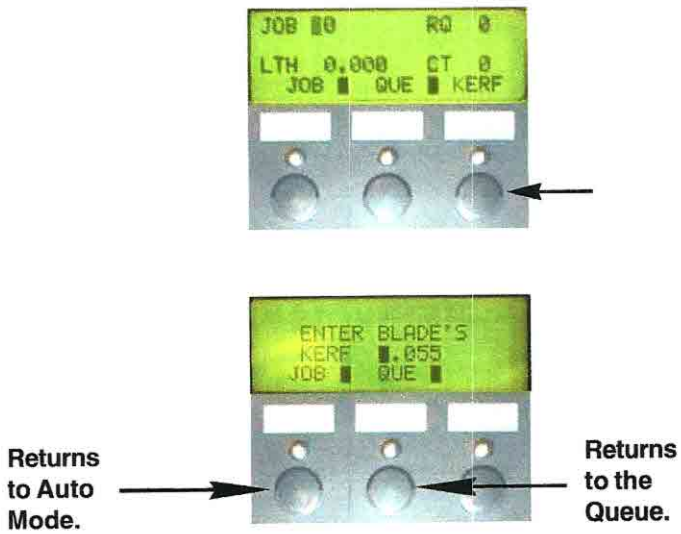
The QUEUE may be exited to the previous screen at any time by pressing the key under JOB

At completion of the "QUEUE", the machine will shut down if "0" has been entered in the "POWER DWN TIMER" parameter or continue running for the specified time up to a maximum of 180 minutes.

NOTE: For angled cuts, see "Kerf Correction" on the following page.

KERF CORRECTION for ANGLE CUTTING

When making mitered cuts, the part length must be set longer than the desired length by an amount called the "KERF CORRECTION" or the kerf value must be adjusted. This is due to the fact that the PLC will not account for a difference in the kerf value at various angles. If the kerf value is to be adjusted it's value can be accessed while in Auto Mode. Press and hold the key below the word "KERF" on the display until the display appears as shown. Enter the desired kerf value and press .



The standard kerf and corrected values are as follows:

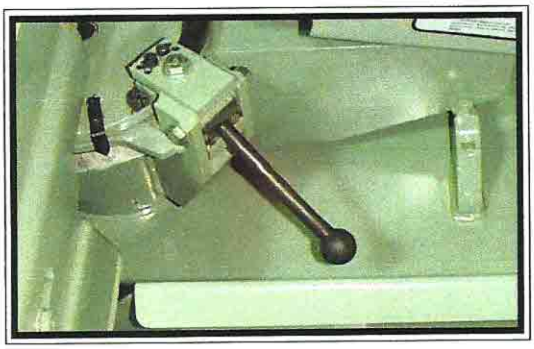
STD KERF @	90°	75°	60°	55°	50°	45°	40°	35°	30°
1" BLADE	.059	.061	.068	.072	.077	.083	.092	.103	.118
1 1/4" BLADE	.066	.068	.076	.081	.086	.093	.103	.115	.132

MECHANICAL CONTROLS

HEAD SWING and BRAKE

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

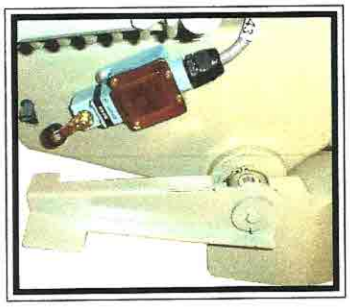
The Angle Brake lever is then locked in position by pushing it into the down position. Note that the angle brake should be locked into position whenever cutting with the saw. The following photograph illustrates the Angle Brake in the locked position at 88°. To set the saw to the 90° position, set the Head in the fully down position and is moved until the frame meets the 90° stop bolt which is located on the vise post.



Head Swing Scale and Angle Brake (Locked)

HEAD UP LIMIT SETTING

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



Head Up Limit Setting Lever

COOLANT FLOW

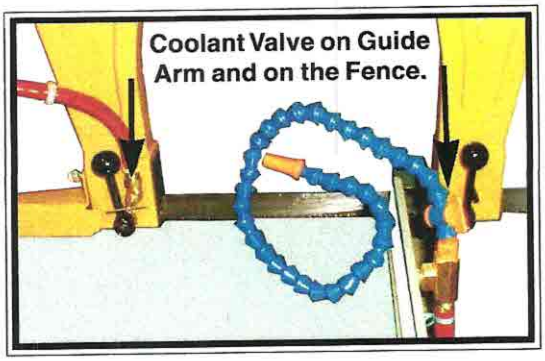
The main coolant control is found on the control panel.

WASH: Coolant flows any time the machine is under power, permitting wash down with spray nozzle without running machine.

OFF: No coolant flow.

ON: The coolant flows only when the blade is running **OR** when the blade is running and the head is descending. This is selectable via the PLC parameters.

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



The left guide arm supplies a flow of coolant that should flood the blade as it moves through the carbide pads into the material to be cut. The adjustable spout on the left guide arm should be set with the blade speed to provide the flood of coolant necessary.

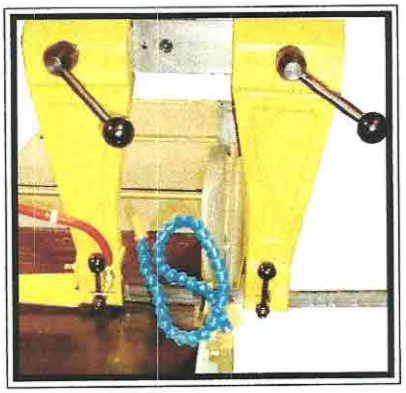
The right guide arm provides a coolant flow through the flexible hose that can be pointed directly where necessary. This flexible hose should be used when cutting solid bars, bundles, or wide structurals. Set the flow of coolant directly into the opening in the material where the blade is cutting.

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

GUIDE ARM POSITIONING

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

To adjust the guide arms the locking handles are loosened and then the guide arms will slide on the main guide bar which holds them. To loosen the handle it should be turned counter clockwise and to tighten the handle, turn it clockwise. The photo illustrates the Guide Arms with the handles in the Locked position.

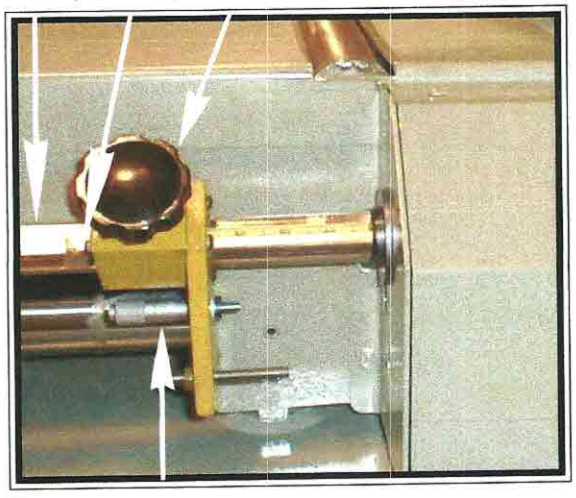


Guide Arms with Handles Locked (4 to 6 O'clock Position) Carbide Levers in Tensioned Position (Upright)

SHUTTLE LENGTH CONTROLS

The controls shown below are used in conjunction with the Sequencer Control to maintain the cut lengths. There are separate controls for rough length and fine tuning a cut length.

Rough length controls, Scale, Pointer, and Locking Knob



Micrometer head for close tolerance control

HYDRAULIC FEED CONTROL

The Hydraulic Feed Control is located adjacent to the drive wheel box. These controls allow independent control of Feed Force and Feed Rate.

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

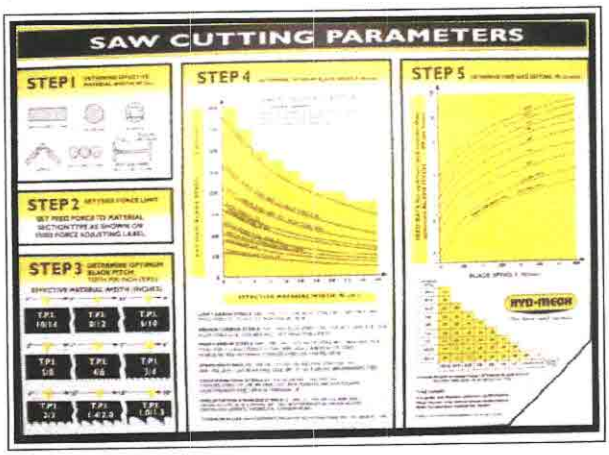
Fast Approach Lever
Depress for fast head descent.

Feed Rate Knob
Used to control speed of Head Descent. The scale reads inches per minute.

Hydraulic Feed Control

CUTTING PARAMETERS CHART

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



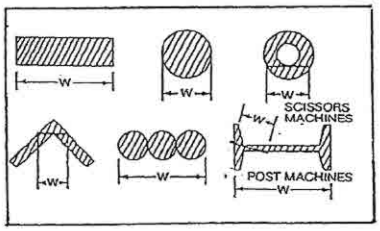
Saw Cutting Parameters Chart

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) Both effective material width and guide arm width are used in setting the saw.

2) Guide arm width is the distance between the guide arms and is used in STEP 2.

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

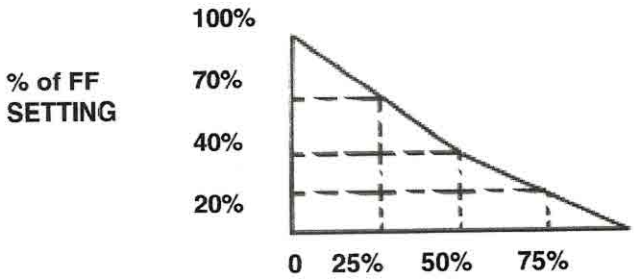
STEP 2, SET FEED FORCE LIMIT

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

CUTTING SOLIDS

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

EXAMPLE: When cutting a solid 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.



MAT'L WIDTH as % os CAPACITY

CUTTING STRUCTURALS

A reduced Feed Force Setting is used when cutting structurals:

For structurals, a blade finer than Optimum can be used for more efficient cutting.

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

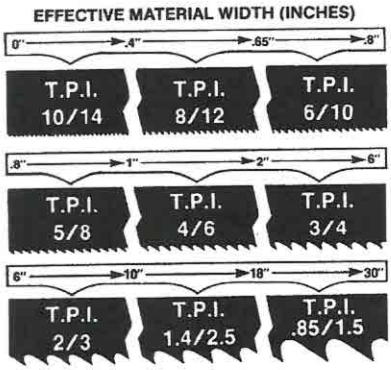
For OPTIMUM BLADE SELECTION, see STEP 3

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

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.)

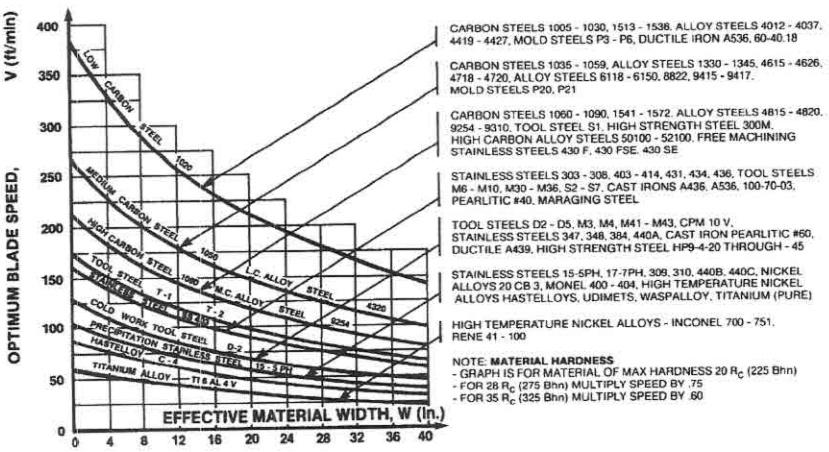
It is impractical to change the blade to the proper pitch every time a different width of material is cut and it is not necessary, but remember that the optimum blade will cut most efficiently. Too fine a blade must be fed slower on wide material because the small gullets between the teeth will get packed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

In our Example #1 : Effective material width of 8" (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.

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.



Optimum Blade Speed Curves

In Example #1

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

For 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.

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

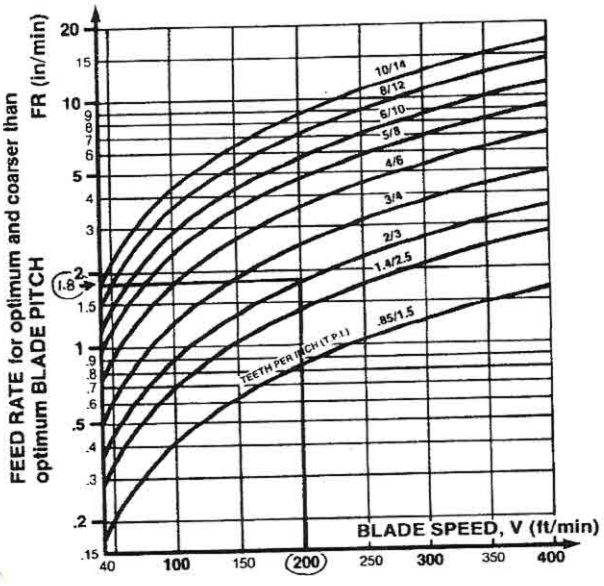
Materials and Blade Speed

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

Feed Rate Knob

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



Feed Rate Calculation

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

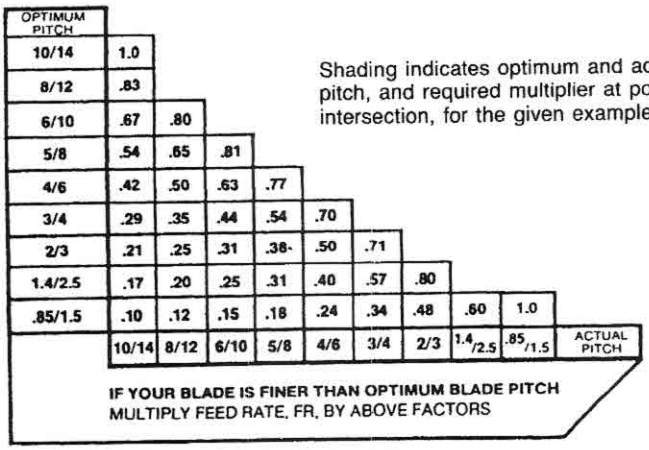
- On the horizontal axis (blade speed axis), find 200 ft/min(60mm/min).
- Find the point where a vertical line from 200 ft./min. (60mm/min) would intersect the 2/3 blade pitch curve.
- From this intersection point run horizontally left to the vertical (FEED RATE) axis, to arrive at 1.8 in/min. (45mm/min)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

---- Continued ----

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.

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



Optimum versus 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 I — 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)

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 I — 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)

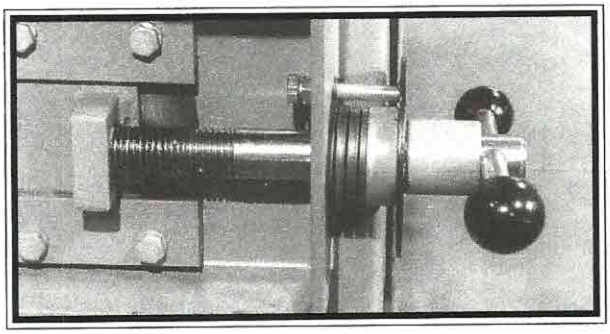
SECTION 3, MAINTENANCE and TROUBLESHOOTING

BLADE CHANGING PROCEDURE

NOTE: Wear gloves for protection from the sharp blade.

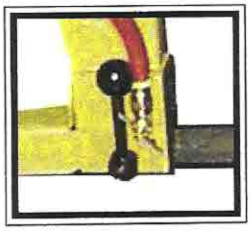
1. Open the Idler Wheel and Drive Wheel doors and swing the head to 45° as this will make it easier to grip the blade closer to both wheels.

2. Loosen the Blade Tensioner by turning counter clockwise.

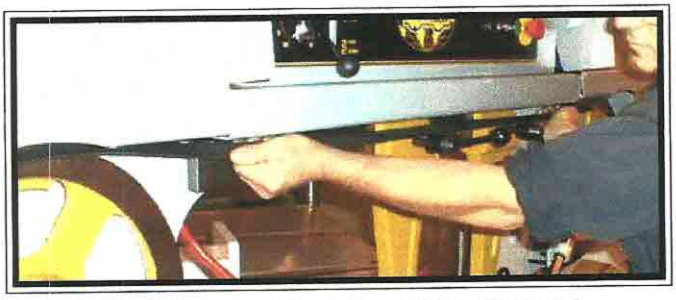


Blade Tensioner

3. Loosen the carbide tension handles by turning counter clockwise 1/4 turn.



4. At the top of the head, the saw blade runs in a protective channel. Grip the blade at each end of this channel and twist the blade teeth down past the channel and slide the blade forward. Let the blade rest on the out feed table, then slide the blade down and out of the carbide guides.



Blade Removal from Top Blade Channel

5. Before installing the new blade, check that it measures 1.075" wide including the teeth. Some blade manufacturers supply blades that measure 1" including the teeth. In this case you may not be able to adjust the head down limit switch to complete the cut.

6. Your new blade will be in a coil. While wearing gloves, hold the blade away from yourself, twist the blade to uncoil it. Do not let the blade teeth bounce on the concrete floor as some damage may be caused.

7. Place the new blade in the carbide guides and then slide the blade over the wheels. The teeth should be pointing towards the drive side as they pass through the carbide guides.

8. With the blade in place, turn the tensioner handle clockwise until the large black washer contacts the stop bolt as shown on the previous page. This will set the blade tension correctly.

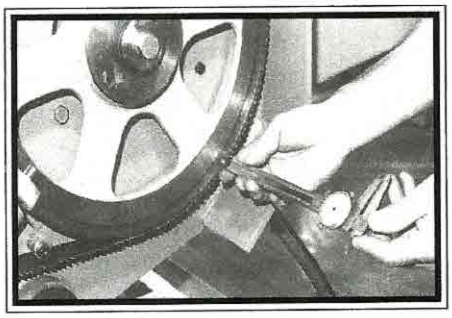
9. With the blade tension set, turn the two carbide locking handles clockwise to the locked position. Jog the blade a few rotations to check that the blade is not moving in or out on the blade wheels.

BLADE CHANGING PROCEDURE, CONTINUED

9A. As the blade tracking will stay fairly constant, it should be checked occasionally as shown on the drive wheel tracking photo below. The blade teeth should protrude from .185" to .200" from the face of the blade wheels. If the tracking requires adjustment, follow the instructions below.

BLADE TRACKING ADJUSTMENT

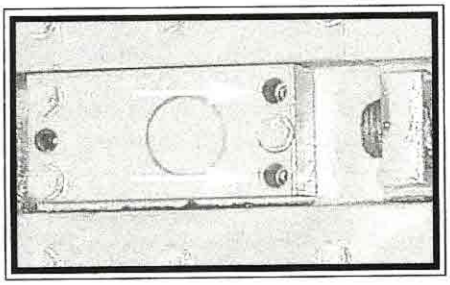
10. First, inspect the blade wheels for wear or damage and repair as required. Blade tracking adjustment should always begin at the wheel where the tracking is farthest out of specification. Using the instructions below, adjust the worst wheel, jog the blade and recheck both wheels. Repeat this process until both wheels are within specification.



Checking the blade tracking with a calliper.

10A. *Idler Wheel Adjustment*

On the blade tensioner slide assembly, there are three 9/16" hex head bolts. Loosen the two bolts at the left end by 1/4 turn. Loosen the single bolt at the right side of the slide assembly by 1/2 turn. In the two holes above and below this bolt are two 3/16" allen key set screws. Turn both set screws 1/4 turn and tighten the hex bolt at the right, then the two bolts at the left. Turning the set screws clockwise will pull the blade on to the wheel, and turning counter clockwise will push the blade off the wheel. Each 1/4 turn will move the blade approximately .02". There is also a single set screw at the left end of the slider. Turning it clockwise will push the blade off the wheel.

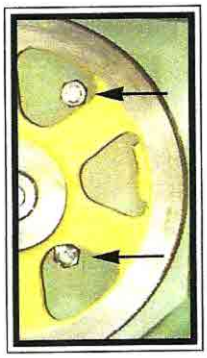


Idler wheel tracking set screws & hex bolts found on the slide assembly.

10B. *Drive Wheel Adjustment*

On the wall behind the drive wheel are two adjusting bolt assemblies and two hex bolts. Loosen all four of them with a 3/4" socket and turn the larger hex head bolts 1/4 turn with a 1 1/8" socket and extension and then tighten the two bolts in the assemblies, then tighten the two hex bolts et the left. Turning the 1 1/8" bolts clockwise will pull the blade on to the wheel and turning counter clockwise will push the blade off. Each 1/4 turn will move the blade approximately .02".

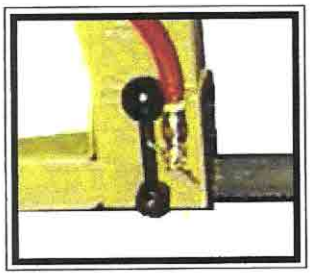
11. Check the blade brush adjustment (Pg 3.3) to be sure the blade is being cleaned properly.



Drive wheel tracking bolt assemblies.

BLADE GUIDE ADJUSTMENT

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

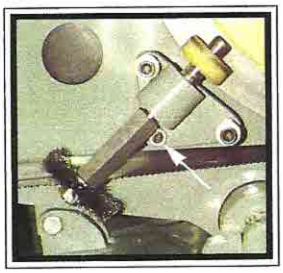


Idler guide arm carbide locking handle in the locked position.

BLADE BRUSH ADJUSTMENT

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

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



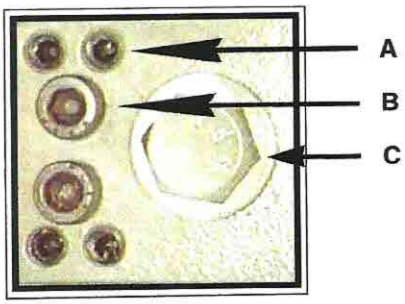
Blade brush adjusting screw & hex nut.

ANGLE BRAKE ADJUSTMENT

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

ANGLE BRAKE ADJUSTMENT PROCEDURE

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



Angle Brake Adjustment Screws.

DRIVE BELT REPLACEMENT

The drive belt on the S-22A is a long life grooved belt. It should last for thousands of hours of operation and should rarely require replacement. See the BLADE DRIVE ASSEMBLY on Pg 6.2.

HEAD DOWN LIMIT SWITCH

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

The Head down limit switch is made with the Head fully down and when the spring post contacts the limit switch at the top of its travel. The Head Down Limit switch is located in the electrical box as shown in the photo.

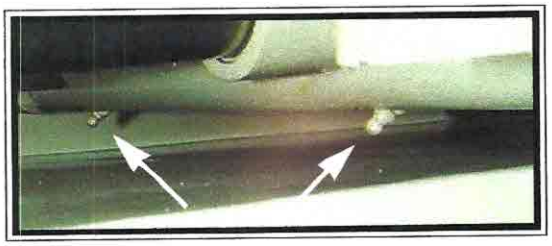
Adjustment of the limit switch is made by changing the position of the set bolt which is located on the end of the spring post. Lengthening the set bolt will cause the limit switch to activate sooner as the spring post meets the limit switch roller.

Shortening the setting bolt by turning it into the spring post will lengthen the time before the Head limit switch is activated.

Head Down Limit Switch

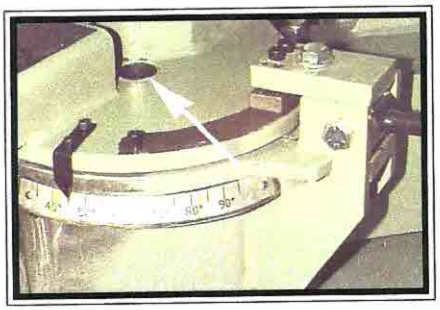
LUBRICATION

The S-22A was designed to minimize the maintenance requirements. Moving assemblies and contact faces need lubrication on a regular schedule if they are in use heavily or not. The lubrication requirements are primarily the saw pivot points and shuttle assembly which are equipped with grease fittings, and metal to metal surfaces that require lubrication to prevent wear and seizure.



Shuttle grease fittings can be accessed from either side of the shuttle

NOTE: Hyd-Mech recommends Monthly lubrication.

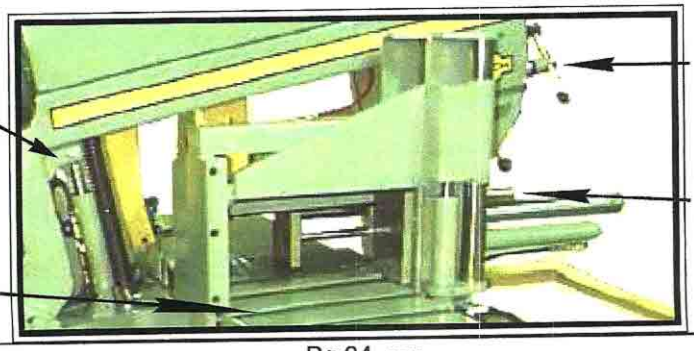


Swivel Pivot pin fitting under dome cap.

Head horizontal pivot fitting.

Guide Arm Rail.

The S-20A Series II rear view shows lubrication points that should be attended to on a monthly basis. Lubrication should be a general purpose grease.



Head PivotSpring Post & Cylinder Eye.

Infeed rollers.

Blade tension shaft and idler way, behind cover.

Vise, Shuttle, and bundling assemblies.

HYDRAULIC MAINTENANCE

There are only FOUR 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. In general, if the oil level is maintained and the filter is changed as recommended, there is no need to change the oil unless there are visible signs of degradation such as;

Rapid darkening of oil.
Milky or hazy oil colour.
Varnish or sludge formation.
Burnt smell from the oil.

However, if the machine is exposed to extreme temperature variation and high humidity, then the oil should be changed every 2000 operating hours or at least once a year. 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 8 US gallons.

Recommended replacement oils:

Chevron	AW Hydraulic Oil 46
Esso	NUTO H46
Mobil	Mobil DEC 25
Texaco	Rando HD 46
Shell	Tellus 46

3. **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)

4. **OIL PRESSURE -** Oil pressure is factory set to 500 PSI (3263 kPa) and should not require further attention except precautionary observation at start-up and every few days thereafter.

CLEANLINESS

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

TROUBLE SHOOTING GUIDE

Most problems which may occur have relatively simple 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.	Chek if guides worn.
		1d.	Excessive feed rate.	1d.	Check for the proper cutting parameters.
2.	Saw is cutting out of square horizontally.	2a.	Stock not square in vises.	2a.	Adjust accordingly.
		2b.	Head not at 90 degrees.	2b.	Reset.
3.	Blade comes off wheels.	3a.	Not enough blade tension.	3a.	Tension blade.
		3b.	Improper tracking.	3b.	Adjust.
4.	Blade stalls in cut.	4a.	Not enough blade tension.	4a.	Tension blade.
		4b.	Excessive feed force.	4b.	Reduce.
		4c.	Excessive feed rate.	4c.	Reduce.
5.	Blade vibrates excessively.	5a.	Blade speed too fast.	5a.	Reduce.
		5b.	Guide arms too far apart.	5b.	Adjust accordingly.
		5c.	Not enough blade tension.	5c.	Tension blade.
6.	Excessive blade breakage.	6a.	Excessive blade tension.	6a.	Reduce blade tension.
		6b.	Excessive feed rate.	6b.	Reduce.
7.	Tooth strippage.	7a.	Blade pitch too fine.	7a.	Select coarser pitch.
		7b.	Blade brush not cleaning.	7b.	Adjust or replace 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.

PROBLEM	PROBABLE CAUSE	SOLUTION
9. Saw will not start.	9a. Motor overload has tripped.	9a. Depress each of the overload buttons located in the electrical box. Depressing one button at a time and trying to start the saw will indicate which motor was overloaded.
	9b. Control circuit fuse has blown.	9b. Replace the fuse with a 5 Amp 250 Volt AG1 type fuse. Random blowouts may occur but a quickly repeated blow-out points to an internal wiring fault.
10. Saw starts but will not run after Start button has been released.	10. On machines so equipped, the out-of-stock or blade breakage limit switch has been tripped.	10. Reload with stock or remount blade.
11. Saw starts but no hydraulic functions.	11a. If blade wheels run clockwise, wrong phase order in power connection to saw.	11a. Stop immediately; reverse any two of the 3 phase connections.
	11b. If pump is noisy cause may be low hydraulic oil level.	11b. Stop immediately, add hydraulic oil. (See pg.3.5 hydraulic maintenance.)
	11c. Pump-motor coupling has separated.	11c. Adjust accordingly.
12. Saw starts but only front vise functions.	12. Mode Selector switch is in the "Neutral" position.	12. Select "Manual" mode.
In Manual Mode		
13. Head will not rise.	13. Head up limit is set fully down.	13. Readjust head up limit switch bracket.
14. No individual function will respond to its manual control switch.	14a. Observe pilot light(s) on relevant valve.If pilot light related to inoperative function fails to light, problem is electrical.	14a. In case of head function non-response check the related limit switches. Limit switch levers should operate freely and emit an audible click on both depress and release. If not replace the switch. To check the switch unit itself remove the switch lid and wire together the two terminals closest to the wiring port. If function now responds to manual switch replace limit switch. If function still does not respond then. Open panel door to gain access to vaves. Remove coil retaining nut and withdraw problem related coil, replace it with any other coil from the group. If the problem remains it requires the attention of a qualified service person.

---- Continued ----

PROBLEM	PROBABLE CAUSE	SOLUTION
	14b. 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.	4b. Disassembly of hydraulic valves should be under taken only by qualified service personel or those knowledgeable with hydraulic components.
15. Head will not descend.	15a. Feed Rate Valve is fully closed - pointer is set on "0" or close to "0" in/ min.	15a. Turn Feed Rate Knob counter clockwise to open valve.
	15b. Feed Force Limit is set too low.	15b. Increase Feed Force Limit
	15c. Pointer is not adjusted .	15c. Loosen pointer, turn knob clockwise until it bottoms; tighten pointer at "0".
In Automatic Mode	15d. Check for physical interference preventing the the head from falling.	15d. Remove obstructions.
16. Auto cycle will not start.	16. Proper input or outputs not present.	16. Check I/O led's, auto mode & hyd "on" should light. Hyd enable output should light.
17. Auto cycle stops before completion.	17. Proper input or outputs not present. Possible problem at head up/ down, shuttle fwd/rev limit switche(s).	17. Run saw in auto and check for I/O's when cycle stops.
18. Functions will not work in Automatic cycle.	18. Missing output for function not working.	18. Check output led for missing function. If led is on, check for lighted connector at directional valve for that function.

TROUBLESHOOTING THE SEQUENCER

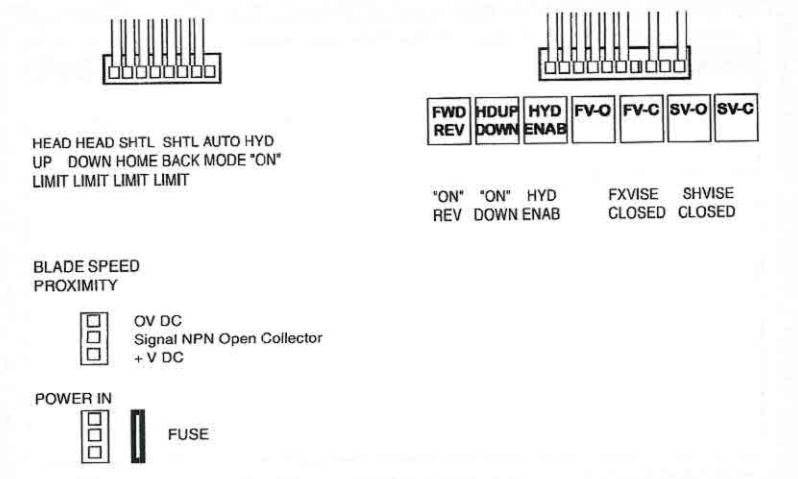
Removing the electrical control box cover exposes the electrical wiring of the S-20A Series II. The Sequencer Control Board as viewed from the rear is shown.

The INPUT LED's light when the condition is met. All of the inputs are optically isolated.

The OUTPUT LED's light when the program calls for an output relay to be energized except for head up which will have the "ON" DOWN led go off.

If the Blade Speed Proximity connections are disconnected, they must be replaced in the correct order.

Power from the transformer is protected by a .25 amp fuse.



PROGRAMMABLE LOGIC CONTROL, MITSUBISHI 100

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

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

The inputs used include;

- a head up limit switch, a head down limit switch;
- the machine function switches & push-button
- also a signal from the auto/manual push button (telling the PLC whether auto or manual operation has been chosen).

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

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

To view the PLC parameters:

In manual mode, with front vise switch in 'CLOSE' position press FWD and REV keys simultaneously (not more than 0.5 sec. apart). The PLC will prompt for a password which is obtainable from Hyd-Mech Saws. If the password is correct a screen of parameters will appear. The display will show two lines of parameters at a time. The first display is for the machine's self calibration of it's length control. If the length control calibration is necessary, follow the calibration procedure on page 48. To move through the parameters use the cursor keys to scroll up or down. To change a parameter, cursor to that parameter line, and, using the number keys, type in the new value and press enter. To leave the parameters press the Auto/Man key. The following page lists the available parameters and their definition.

ACTUAL LTH **Actual Length value.** value entered after performing length calibration procedure (described later in this section). PLC uses this value to calculate it's length encoder resolution and stroke parameter. **Note:** If Calibration Procedure is activated and not completed, or activated and a value not entered for ACT LTH, this value will reset to 00.000 and the PLC will not be able to count/display lengths.

LTH CONST **Length constant.** Specifies linear distance of shuttle movement in inches per one pulse of shuttle encoder.

ACCEL DIST **Shuttle acceleration distance.** Distance, in inches, the shuttle will travel slowly before reaching fast speed while starting to move in either direction. (i.e. 1.000).

DECEL DIST **Shuttle decceleration distance.** Distance, in inches, the shuttle will travel slowly reaching home or target position. (i.e. 1.000)

MIN FST DIST **Minimum fast speed distance.** If programmed length is smaller than this parameter override to slow speed. (Shuttle)

TARGET WINDOW **Allowable +/- tolerance** from programmed length.

FVO DWELL **Delay time** for the opening of the fixed VISE in seconds.

SVO DWELL **Delay time** for the opening of the shuttle VISE in seconds.

CLOSE TIME **Delay time** for the closing of the shuttle or fixed VISE in seconds.

MIN BLD SPEED — **Minimum blade speed** on which blade breakage will be activated.

SPD PROX DELAY — **Delay in monitoring** of the blade speed proximity switch during acceleration of the blade from start to desired speed set by the potentiometer.

POWER DWN TIMER — **If "0" selected,** then the machine will shut down after the job is completed. This will allow the machine to continue running for a specified time after the job (in Manual Mode) or the cyle (in Auto Mode) has been completed.Range from "0" to "180" minutes.

BLADE CLEAR — **If set to "YES";** When the AUTO cycle reaches the function of head up, the shuttle will retract the material from the blade by 1/8" before the head will move up. When the head reaches the up position the next length of material is shuttled into position.

TRIM CUT — **If "YES" selected** the machine will perform a facing cut of the material at the beginning of an automatic cycle.

---- Continued ----

COOLANT **When "BLD" selected,** coolant flows when the blade is running. **When "BLD+ DWN" selected,** coolant flows when the blade is running and head is moving down.

QUEUE The **QUEUE** allows the operator to run several jobs (max 5) in series. **If "REPEAT"** is selected the above series will be executed the selected number of times.

PLC 100 TROUBLESHOOTING

PROBLEM #1, *for automatic models with a shuttle.*

PLC is not measuring lengths.

POSSIBLE CAUSES;

i) Encoder	- pinion gear loose on encoder shaft
	- bad encoder
ii) Encoder Cable	- bad connection at encoder or PLC
	- open or shorted wire
ii) PLC unit	- damaged hardware
iii) Display unit	- no power from PLC unit
	- damaged hardware
iv) Actual Length (Actual LTH) Parameter value is set to 00.000	- perform self calibration procedure and enter value.

DIAGNOSIS;

I) With the machine in MANUAL mode; bring the shuttle forward to the home position and clear the length display to read '0.000'. Run the shuttle, in slow speed, to the rear then back to home, moving full shuttle strokes.

- length should accumulate on the display as a positive number when the shuttle move away from the blade and should count is negative going back and goes in a positive direction coming toward home, then the green channel wire and the white channel wire should be reversed.
- if the display alters between 0.000 and 0.001 or 0.000 and -0.001, then one of the encoder channels is not being recorded correctly.

ii) To determine the cause, first, check the encoder cable connections at both ends to be sure all four wires are connected properly. (See page 47 for connection / wiring information)

Measure the voltage:

a) At encoder connector; - between 0 V pin and 24 V pin. This voltage should be a minimum of 22 to 26 VDC.

If the voltage is incorrect; check encoder cable continuity - if OK, possible PLC problem.

If the voltage is correct, go to step b)

b) At encoder connector; - between 0 V and channel A and 0V and channel B. This should be slightly less than supply voltage at each channel.

If voltage is incorrect at this point, check for proper continuity of these wires and repair as necessary.

NOTE: When checking the encoder cable for continuity, each wire should also be checked for shorting to ground and shorting to each other. If voltage to the encoder is correct; go to Step C).

c) At the encoder connection of the PLC; - between 0 V and A&B channels.

With the shuttle moving slow, voltage should be approximately 10 -13 VDC. Input LED's X0 and X1 should flicker or go dim with the shuttle moving. If these LED's show no change with the shuttle moving, the encoder is likely at fault. Check that the pinion gear is securely fastened to the encoder shaft and that it can rotate along the rack as the shuttle moves.

If all mechanical components are functioning correctly then the encoder is defective.

If all tests check positive, the problem is in the PLC unit.

PROBLEM # 2, *for automatic models with a shuttle.*

Inaccurate lengths in AUTO mode.

POSSIBLE CAUSES;

i) Encoder - pinion not engaging rack all the way from front to back; mechanical interference, pinion loose on encoder shaft.

ii) Encoder Cable - bad connection at encoder or at PLC
- intermittent open in one or more signal wires

iii) Improper programmed information
- existing parameter(s) incorrect
- incorrect blade kerf

iv) PLC - faulty PLC unit (not repairable in the field)

GENERAL RULES - Normally, three types of length inaccuracies may occur.

1) Inconsistent - lengths cut are not consistent, error changes. It doesn't matter how long the part required is the error is never the same.
Cause: - most likely a defective electrical, hydraulic or mechanical component.

2) Consistent - lengths cut are consistent and the error is also consistent. The error always stays the same regardless of part length.
Cause: - Kerf value

3) Linear - lengths cut are consistent but the error increases as the part length increases. The longer the part the greater the error.
Cause: - when self-calibration is executed, incorrect "Act Lth" value entered

DIAGNOSIS;

i) Check and record existing parameters. Also check for proper blade kerf.
By making a cut part way into a piece of material and measuring the width of the cut, the operator can check blade kerf.

INCONSISTENT INACCURACY

i) - with the machine in MANUAL mode, move the shuttle all the way forward and clear (zero) the length display. Move the shuttle in reverse, in slow speed, all the way to the end of it's travel. Return the shuttle forward to the home position, also in slow. The display should read 0.000" +/- .005". Do this test several times to be sure the read-out is repeatable.

DIAGNOSIS;

i) Following the same procedure, run the shuttle alternating between fast and slow speed going back and coming forward. Again the display should be able to read 0.000" +/-.005" when returning to the home position. If the display does not read as specified:

- check the encoder pinion gear to be sure it can run smoothly down the rack and that the gear and rack teeth engage over the entire travel of the shuttle.
- check that the pinion gear is tight on the encoder shaft.
- check the encoder cable connections, a loose connection could easily cause this concern.
- remove the encoder from the machine and check that the shaft can rotate freely. There should be no binding or rough spots felt when spinning the shaft. Plug the encoder cable into the encoder, clear the length display, and rotate the shaft exactly (or as close as possible) one revolution. The display should read approximately 3.142" (positive or negative). Repeat this 3 or 4 times, spinning the shaft several times between tries.

---- Continued ----

CONSISTENT INACCURACY

(make sure blade kerf value is correct)

- change "Actual Pos." parameter to 1. This will make the PLC show actual shuttle travel in AUTO

With no material in the machine:

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

LINEAR INACCURACY

(not valid for machines with linear encoder)

i)
- load machine with a piece of stock for test cutting
- open parameters screen
- initiate length calibration (see 48)
- re-enter new ACT LTH (Actual Length) value
- recut test lengths and check if accuracy is satisfactory.

NOTE; Linear inaccuracy may be corrected in two ways, by using the length calibration as described above or by adjusting the LTH CONST as follows;

-load machine with a piece of stock for test cutting
- program the PLC to cut two pieces each of 1", 12" and a length equal to a shuttle and a half of the machine being checked.
-make the cuts and measure as a accurately as possible (vernier caliper)
-using the formula provided below, calculate the new parameter "LTH CONST"

Formula for determining new parameter "LTH CONST"
Measured length divided by Programmed length X Existing constant = New "LTH CONST"

i.e. Programmed length	= 1.00" Measured length	= .999"	-0.001" short
	= 12.00"	= 11.988"	-0.012" short
	= 60.00"	= 59.940"	-0.060" short

Existing parameter "LTH CONST"=0.001256
11.988 divided by 12.00 x 0.001256 = 0.001255
The new parameter "LTH CONST" would be 0.001255. This value should be entered as the new "LTH CONST" parameter and test cuts repeated. Adjust the parameter again if necessary.

GENERAL RULE: Lowering the parameter value = longer shuttle travel = longer parts
Increasing the value = shorter shuttle travel = shorter parts

---- Continued ----

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

AUTO cycle not being completed

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

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

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

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

AUTO CYCLE SEQUENCE: After the mode push button is in the AUTO position and the job has been Programmed into the PLC, and the Cycle Start push button pressed:

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

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

---- Continued ----

FUSES

The PLC has five glass fuses in line with it.
Fuse '4FU' is a 2 amp instant blow fuse which feeds power to the input side of the PLC through input terminal 'L'.

Fuses '5FU1' to '5FU4' are 3 amp time delay fuses which each supply power to a specific bank of output relays through that bank of relay's 'COM' terminal:

5FU1 is wired to terminal 'COM 1' supplying Outputs	- Y0, Y1, Y2, Y3
5FU2 to terminal 'COM 2' supplying Outputs	- Y4, Y5, Y6, Y7
5FU3 to terminal 'COM 3' supplying Outputs	- Y10, Y11, Y12, Y13
5FU4 to terminal 'COM 4' supplying Outputs	- Y14, Y15, Y16, Y17

PROBLEM # 4

No Display

POSSIBLE CAUSES;

i) No power to the PLC.
ii) PLC unit failure.
iii) Faulty connection of cable between PLC & Interface

DIAGNOSIS;

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

PROBLEM # 5

No Blade Speed Display.

POSSIBLE CAUSES;

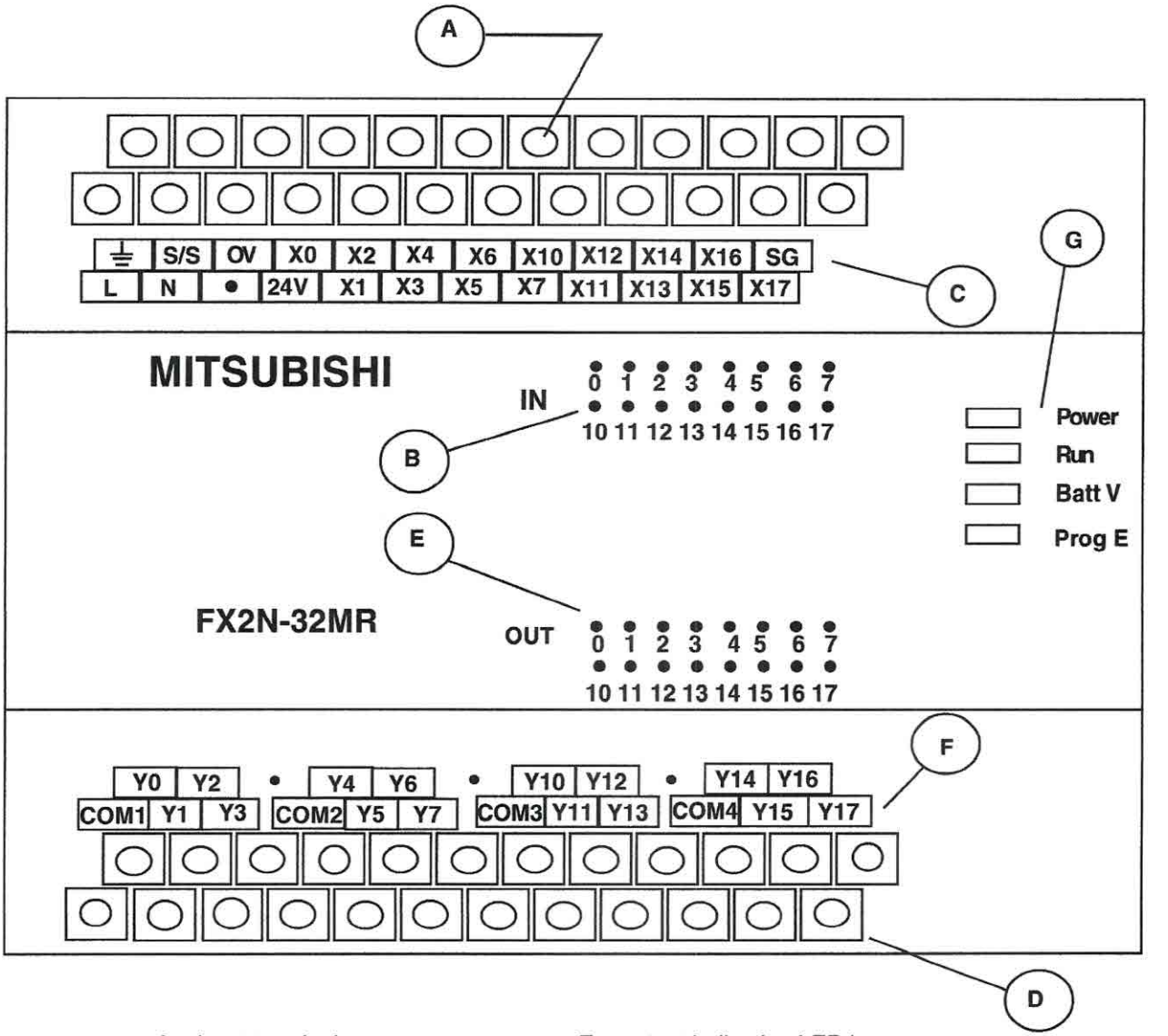
i) Fault at proximity sensor
- bad sensor, misadjusted sensor (gap should be approx. 0.015")
- contamination on the end of the sensor

ii) Fault at the PLC
- bad connection of sensor wiring
- faulty PLC input

DIAGNOSIS;

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

MITSUBISHI 100 INPUTS & OUTPUTS



A - input terminals
B - input indicating LED's
C - input terminal identification
D - output terminals
E - output indicating LED 's
F - output terminal identification
G - PLC status indicator lights

Input and output terminal identification : - the top row of identification labels corresponds to the top row of terminals and the bottom row of labels to the bottom row of terminals.
Input and Output LED numbers correspond to the Input or Output of the same number.
ie. Input LED #0 corresponds to Input X0 . Output LED #0 corresponds to Output Y0

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

Input / Output Terminal Information

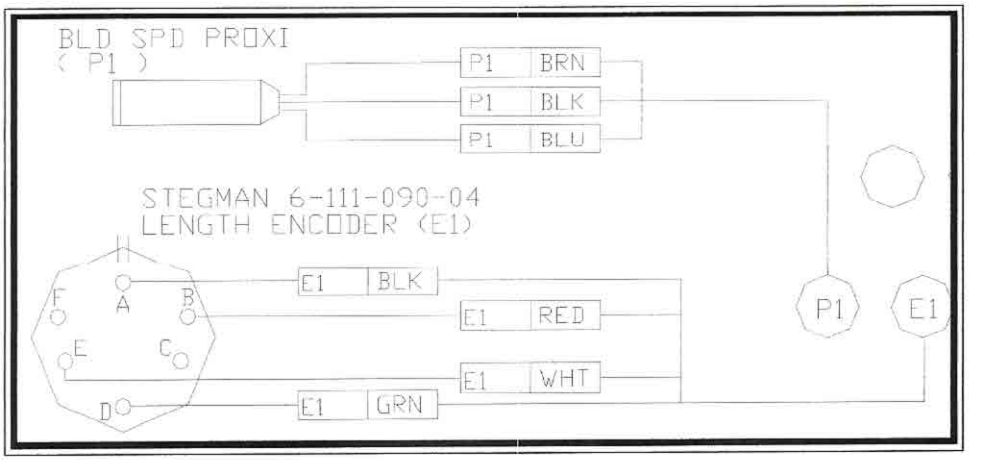
Inputs -

X0 - Shuttle Encoder, Channel A
X1 - Shuttle Encoder, Channel B
X2 - Blade Speed
X3 - Blade Stop
X4 - Head Raise L/S
X5 - Head Lower L/S
X6 - Coolant Switch
X7 - Coolant Switch
X10 - Shuttle Vise Close Switch
X11 - Shuttle Vise Open Switch
X12 - Front Vise Close Switch
X13 - Front Vise Open Switch
X14 - Head Raise S/S
X15 - Head Lower S/S
X16 - Blade Start
X17 - Cycle Start

Outputs -

Y0 - Machine Latch
Y1 - Open
Y2 - Open
Y3 - Shuttle Vise Close
Y4 - Blade Motor Contactor
Y5 - Shuttle Vise Open
Y6 - Coolant Pump On/Off
Y7 - Cycle On
Y10 - Front Vise Close
Y11 - Front Vise Open
Y12 - Shuttle Fast
Y13 - Open
Y14 - Shuttle Rev
Y15 - Shuttle Fwd
Y16 - Head Raise
Y17 - Head Lower
Y17 - Head Lower Relay

ENCODER and PROXIMITY SENSOR CONNECTIONS



To adjust ""LTH CONST", follow this procedure;

Cut length ÷ Programmed length X Existing "LTH CONST" = New "LTH CONST"

Example;

Cut length of 11.998", Programmed length of 12", Existing "LTH CONST" parameter of 0.001256.

11.988 ÷ 12.000 X 0.001256 = 0.001255

The new "LTH CONST" value of 0.001255 should be entered as the "LTH CONST" parameter and test cuts repeated. Adjust the parameter again if necessary.

General rule: Lowering the "LTH CONST" value = Longer shuttle travel = Longer parts.
Increasing the "LTH CONST" value = Shorter shuttle travel = Shorter parts.

SERVICE RECORD & NOTES

DATE	SERVICED BY	COMMENTS

SECTION 4, ELECTRICAL SYSTEM

CONTROL PANEL & COMPONENTS

This machine has been built to the customers requirements, however, if any voltage changes are required, refer to the information on page 4.5 or 4.9 and then consult Hyd-Mech service department before implementing any changes. The control panel layout is shown on pg. 4.2 (sequencer) and 4.3 (PLC).

INITIAL START-UP

At initial hook-up it is important to check that the phase order is correct. This is indicated by the blade drive wheel revolving in a counterclockwise direction and the hydraulic pressure gauge registering a pressure rise.

NOTES:

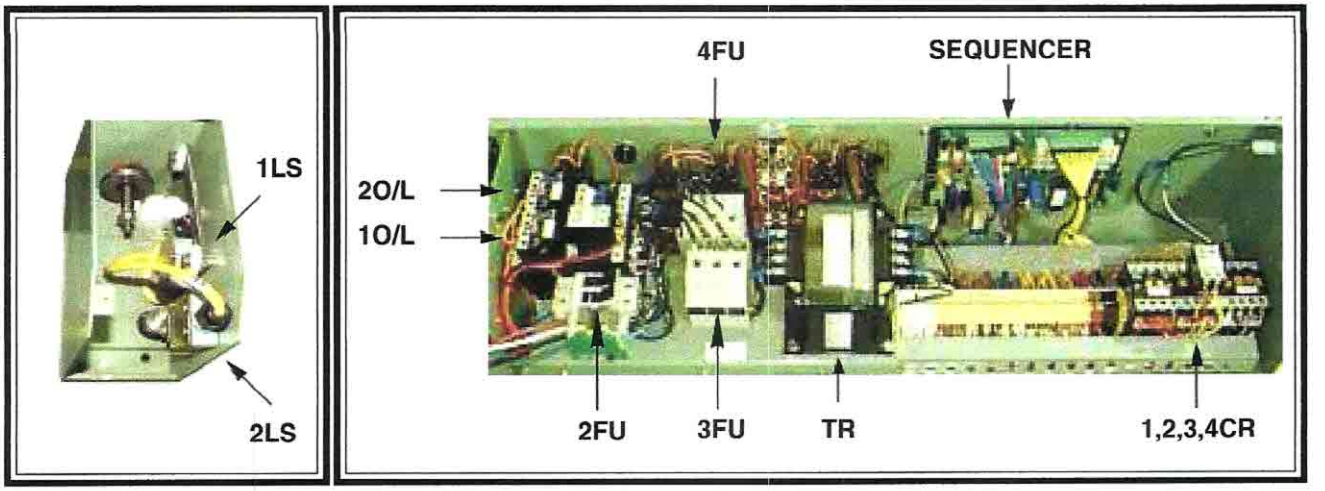
1)The PLC is equipped with a lithium battery to keep the program stored while the power is shut down. The battery will need to be replaced every 3 to 5 years, depending on usage. A visual warning will be displayed on the interface when the battery drains to a certain level. Battaries can be purchased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

2) If the machine is equiped 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.

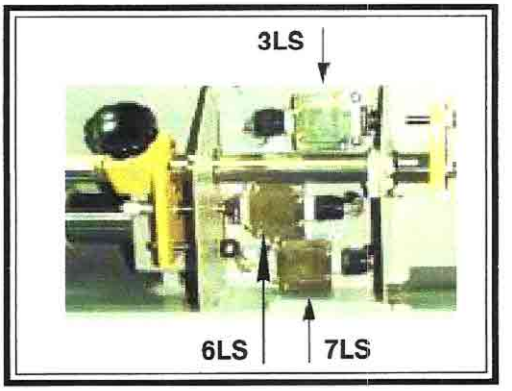
3) All of the machines equipped with a Mitsubushi PLC have a snap on Ferrite core on the interface cable. This is placed near the interface in order to reduce "noise".

4) Hyd-Mech also recomends that an earth ground be installed on this machine.

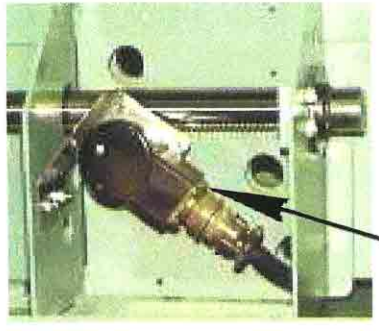
SEQUENCER CONTROL BOX LAYOUT.



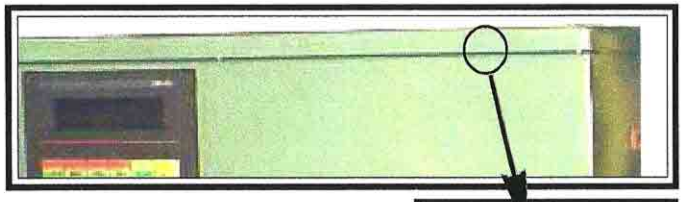
NOTE; **1LS may be located at horizontal pivot shaft.**



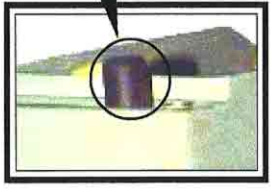
Shuttle length control box.
(Found on the side of the shuttle)



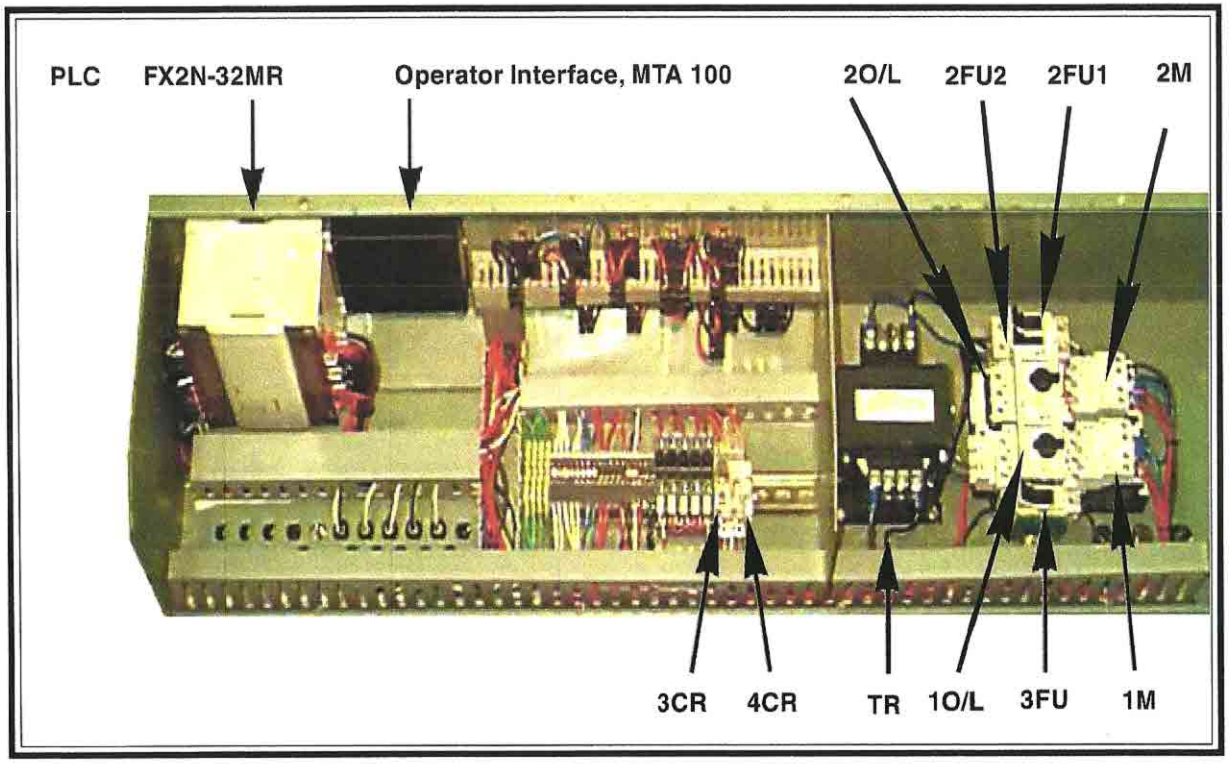
Length Control Box



On machines beginning with serial #'s 80400870, for S20A or XA0400113 for S23A, four rubber bumpers (pn B-1333) were installed at the top of the PLC control box (not sequencer machines). These bumpers will maintain a spacing between the lid and the top of the operator interface. Damage may result if the lid is installed without these bumpers.



Head down limit switch.



SEQUENCER ELECTRICAL PARTS LISTS

LIST OF S22A_S23A SEQUENCER ELECTRICAL COMPONENTS

Item Code as on S22A/S23A Schematic	Description	Part Number	Component Manufacturer
1PB-Emergency Stop Push Button	Red mushroom head, spring return push button. Mounting base with 1 N/C contact block.	ZB2 BC4 ZB2 BZ102	Telemecanique Telemecanique
2PB-Hydraulic Start Push Button	Green, illuminated, flush head push button. Light module with 1 N/O contact block plus 130V (BA9s) light bulb.	ZB2 BW33 ZB2 BW061 SP105	Telemecanique Telemecanique Spectro
14PB-Shuttle Forward Push Button	Pendant (2 step) pushbutton with 2 speed contact block.	XAC B9212 XEN B1181	Telemecanique Telemecanique
15PB-Shuttle Reverse Push Button	Pendant (2 step) pushbutton with 2 speed contact block.	XAC B9212 XEN B1181	Telemecanique Telemecanique
1SS-Coolant Selector Switch	Black, 3 positions, maintained selector switch. Mounting base with 2 N/O contact blocks.	ZB2 BD3 ZB2 BZ103	Telemecanique Telemecanique
2SS-Shuttle Vise Selector Switch	Black, 1 position spring return from left to center & 1 position maintained to right s/s. Mounting base with 2 N/O contact blocks.	ZB2 BJ7 ZB2 BZ103	Telemecanique Telemecanique
3SS-Front Vise Selector Switch	Black, 1 position spring return from left to center & 1 position maintained to right s/s. Mounting base with 2 N/O contact blocks.	ZB2 BJ7 ZB2 BZ103	Telemecanique Telemecanique
4SS-Head Selector Switch	Black, 3 positions, maintained selector switch. Mounting base with 2 N/O contact blocks plus	ZB2 BJ3 ZB2 BZ103	Telemecanique Telemecanique
12SS-Blade Start/Stop Selector Switch	Black, 2 positions, spring return to center selector switch. Mounting base with 1 N/O contact block & 1N/C contact block	ZB2 BD5 ZB2 BZ105	Telemecanique Telemecanique
13SS-Mode Selector Switch	Black, 3 positions, maintained selector switch. Mounting base with 2 N/O contact blocks plus 1 N/C contact block.	ZB2 BJ3 ZB2 BZ103 ZB2 BE102	Telemecanique Telemecanique Telemecanique
14SS-PLC On/Off Selector Switch	Black, 2 positions maintained selector switch. Mounting base with 1 N/O contact block.	ZB2 BJ2 ZB2 BZ102	Telemecanique Telemecanique

LIST OF S22A_S23A SEQUENCER ELECTRICAL COMPONENTS

Item Code as on S22A/S23A Schematic	Description	Part Number	Component Manufacturer
Sequencer	Sequence controller with 'G' chip	SEQUENCER	O.E.S.
3CR	Head down relay	CA2 DN22G6	Telemecanique
10CR	AUTO relay with additional Auxiliary contactor	CA2 DN22G6 LA1 DN40	Telemecanique Telemecanique
11CR	Manual mode relay	CA2 DN40G6	Telemecanique
19CR	Head descending relay plus mounting base.	G2R-2-S P2RF-08-E	Omron
Hyd. Valve Connector	Hirschmann connector	H/927811311	Hirschmann
1FU	Fuse holder 5A Time-delay fuse	BKHT B261 6CC5S	Buss
1 L/S Head Up	Limit switch with roller lever	XCK P121	Telemecanique
2 L/S Head Down	Limit switch with roller lever	XCK L115H7	Telemecanique
4 L/S Out Of Stock	Limit switch with roller lever	XCK L115H7	Telemecanique
P1 - Blade Speed	Proximity switch c/w washer & nut (NPN - N0)	DCA12/4608KS	Burgess-Saia
E1	Incremental encoder for length count (HD20-S19)	6-111090-01	Stegmann
Coolant Pump	Coolant pump 1 Phase /120 VAC	2E-NT	Little Giant
	Coolant Pump Junction Box	SCEJB442	Selectric
	Wire terminal 20-10 AWG	WK4/U	Wieland
	Wire terminal 20-8 AWG	WK6/U	Wieland
	Suppressor	SSQUENCHO1	Selectric
	R-C Suppressor Quenchark	504M02QA100	Quenchark
Options			
Work Lamp	Work lamp 120 VAC	0618-3-AS	Moffatt
3 L/S Blade Break	Limit switch with roller lever	XCK L115H7	Telemecanique
10 L/S Shuttle Home	Limit switch with plunger	XCK L110H7	Telemecanique
11 L/S Shuttle Target	Limit switch with plunger	XCK L110H7	Telemecanique
12 L/S Shuttle Cushion	Limit switch with roller lever	XCK L115H7	Telemecanique
26SS-Oil Heater Selector Switch.	Black, 2 positions maintained selector switch. Mounting base with 1 N/O contact block.	ZB2 BD2 ZB2 BZ102	Telemecanique Telemecanique

LIST OF S22/23A ELECTRICAL COMPONENTS

Item Code as on S22/23A Schematic	Description	Part Number	Component Manufacturer
FX2N-32MR	Mitsubishi PLC.	FX2N-32MR	Mitsubishi
E200	Mitsubishi Interface	E200	Mitsubishi
	Interface communication cable	S22A MITS/S23A FX2N32-009	HMG
	Ferrite core	444164951	Ferrite
3CR	Head lower relay plus mounting base.	G2R-2-S P2RF-08-E	Omron
4CR	Out of Stock relay plus mounting base.	G2R-2-S P2RF-08-E	Omron
Hyd. Valve Connector	Hirschmann connector	H/927811311	Hirschmann
3FU	Fuse holder 5A Time-delay fuse	USM1 ATDR5	Gould
4FU	Fuse holder for "Power" into PLC 2A Instant glass fuse	WK10/Si AGC-2	Wieland Buss
5FU1 - 5FU4	Fuse holder for PLC outputs 3A Time Delay glass fuse	WK10/Si MDL-3	Wieland Buss
1 L/S Head up	Limit switch with roller lever	XCK P121	Telemecanique
2 L/S Head Down	Limit switch with roller lever	XCK L115H7	Telemecanique
4 L/S Out Of Stock	Limit switch with roller lever	XCK L115H7	Telemecanique
P1 - Blade Speed	Proximity switch c/w washer & nut (NPN - N0)	DCA12/4608KS	Burgess-Saia
E1	Incremental encoder for length count (2500 PPR)	6-111090-04	Stegmann
Coolant Pump	Coolant pump 1 Phase /120 VAC	2E-NT	Little Giant
	Coolant Pump Junction Box	SCEJB442	Selectric
	Wire terminal 20-10 AWG	WK4/U	Wieland
	Wire terminal 20-8 AWG	WK6/U	Wieland
	Double ground terminal 20-8 AWG	WK4/D2/2SLU	Wieland
	Suppressor	SSQUENCHO1	Selectric
	R-C Suppressor Quenchark	504M02QA100	Quenchark
Options			
PLC Noise Filter	120v Single Phase, 6 AMP filter	46F4389	Corcom
Work Lamp	Work lamp 120 VAC	0618-3-AS	Moffatt