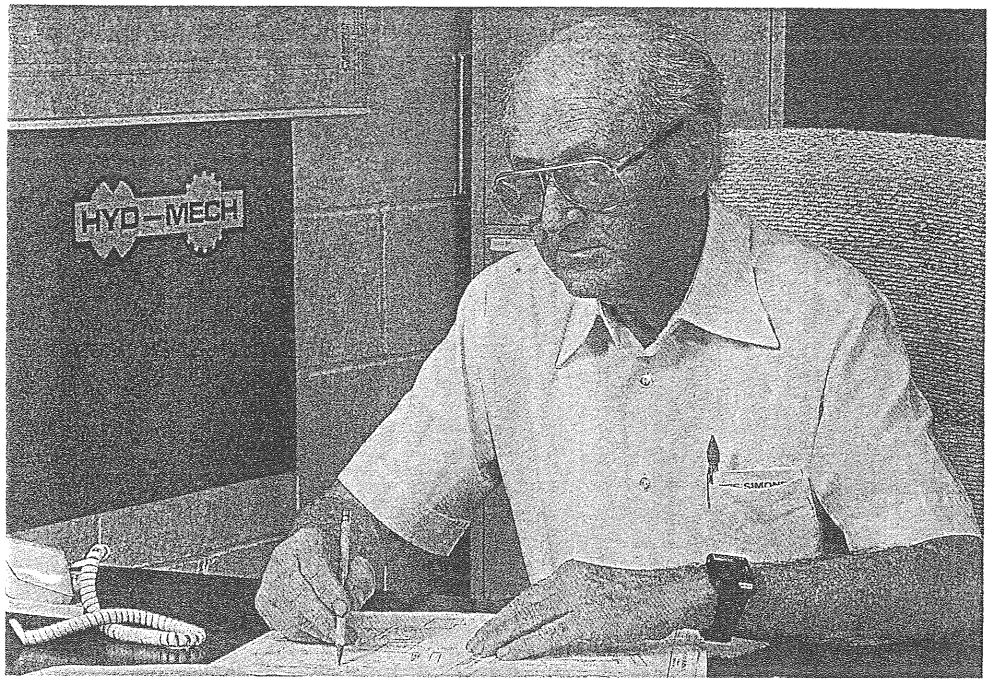


Dear Customer,

As a businessman you understand the necessity of keeping the cost of each step of production to an absolute minimum without sacrificing quality. In the purchase of any new piece of equipment you are looking to increase your production and consequently reduce your cost, while maintaining or improving quality.

With these points clearly in mind we have designed the Hyd-Mech S-20A. Our goal is to change stock cut-off from a "necessary evil" to a money making and time saving part of your operation.

Please use this manual to familiarize yourself and your employees on the proper operation and maintenance of the S-20A.

We appreciate the confidence you have shown in our product and wish you every success in its use.

Sincerely,
HYD-MECH ENGINEERING LTD.

Stan Jasinski, P. Eng.,
President

HYD—MECH

HYD-MECH
P.O. BOX 1030 / WOODSTOCK, ONTARIO N4S 8A4 • PHONE (519) 537-6751 / FAX (519) 539-5843

TABLE OF CONTENTS

SECTION 1 — INSTALLATION

SAFETY

All safety precautions must be observed during installation, operation, maintenance or repair work on the S-20 series bandsaw machine.

- Inspect the machine thoroughly before power hook-up. Special attention should be paid to electrical and hydraulic systems (where applicable) checking for any damage that may have occurred during shipping.
- Power hook-up should be performed by qualified personnel.
- Machine should be used according to its specifications.
- Long hair, loose clothing, gloves, should not be worn while operating the machine.
- Stock must not be loaded while blade is running.
- All guards, covers and doors should be in place and closed while the machine is in operation.
- Long and heavy stock should be supported in front and behind the machine.
- Area around the machine should be kept clean and tidy.
- Operator should keep clear of all moving parts especially the blade and vises.
- If not performing properly the machine should be stopped immediately and repaired by a qualified person.
- Machine should not be modified unless approved by Hyd-Mech. All approved modifications shall be performed by trained personnel.

LIFTING AND SHIPPING

The S-20A bandsaw is crated for shipping, remove the exterior crating and unbolt bandsaw from the base of the crate as shown in Fig. 1-1. Retain the bolts for machine levelling.

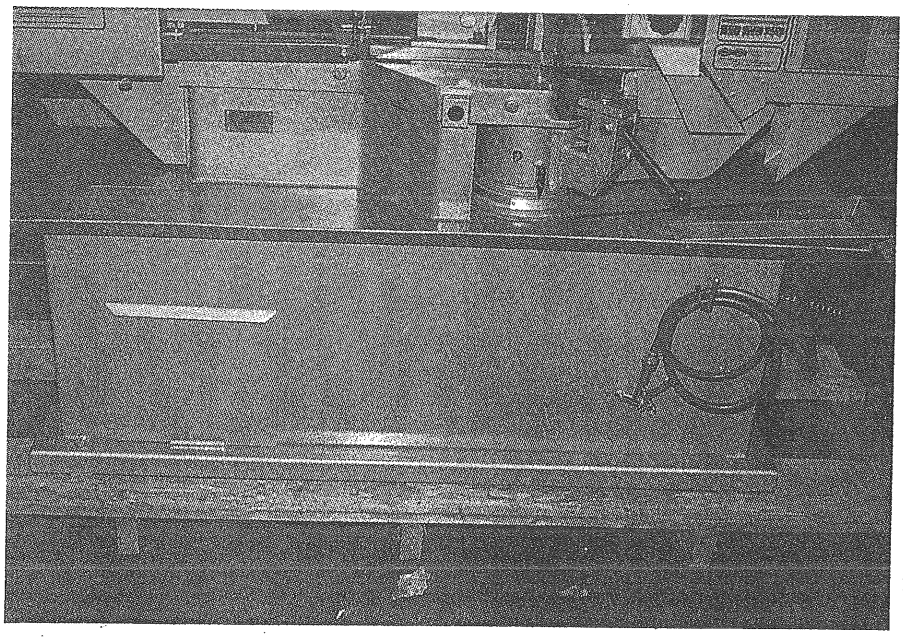


Fig 1-1

To lift the S-20A bandsaw an overhead crane with a "T" shaped spread bar and three lifting belts should be used, placing one belt around each end of the table tray and the third around the end of the shuttle table tray being sure the belt does not place any pressure on the length control shaft. Figs. 1-2A-B.

WARNING: UNDER NO CIRCUMSTANCES SHOULD THE LIFTING BELTS APPLY ANY EXCESSIVE FORCE AGAINST THE HEAD FRAME.

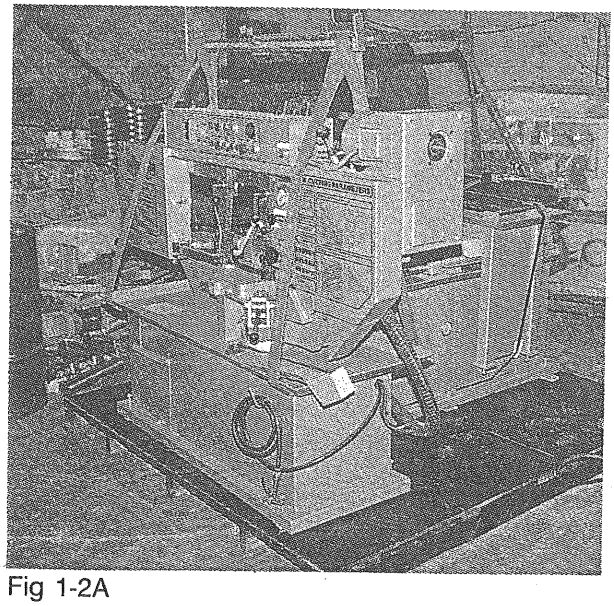
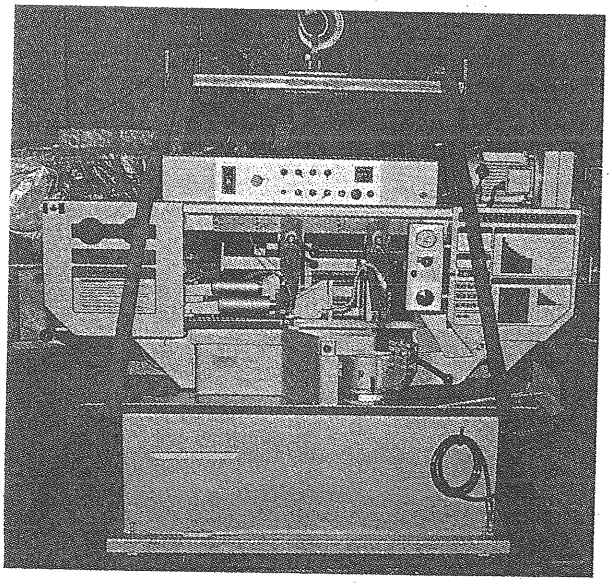


Fig 1-2A



OUTFEED TABLE INSTALLATION

Position the outfeed table against the main saw table and clamp a straightedge in the vise. Move the table so there is an 1/8'' gap between the straightedge and the outfeed table fence. Bolt the outfeed table assembly in this position.

Once the outfeed table is bolted in place it is necessary to check the level of the top plate. Using a straight edge resting on the saw table wear strips, check that the outfeed top plate sits 1/4'' below the wear strip height. (This is necessary to allow the head frame to complete the cut when making angle cuts). Adjustment of the top plate can be made either with the table frame foot bolts, or more effectively using the push pull bolt arrangements on the top plate.

LEVELLING

Using a machinist's level, level machine from side to side and back to front.

NOTE: A small incline from left to right as well as from front to back will improve coolant return flow to the coolant tank.

WIRING CONNECTIONS

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

In order to provide safe operation as well as to prevent potential damage to the machine, only qualified personnel should make the connections.

BEFORE START-UP THE FOLLOWING TWO POINTS SHOULD BE CHECKED FOR
- signs of damage that may have occurred during shipping to the electrical cables and the hydraulic hoses.
- the hydraulic oil level is between the upper and lower lines on the level gauge.

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

Power connection to the machine is made to L1, L2 and L3 terminals at the blade motor contactor inside the control box.

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

Attention: Running of the hydraulics "backwards" can damage the hydraulic pump.

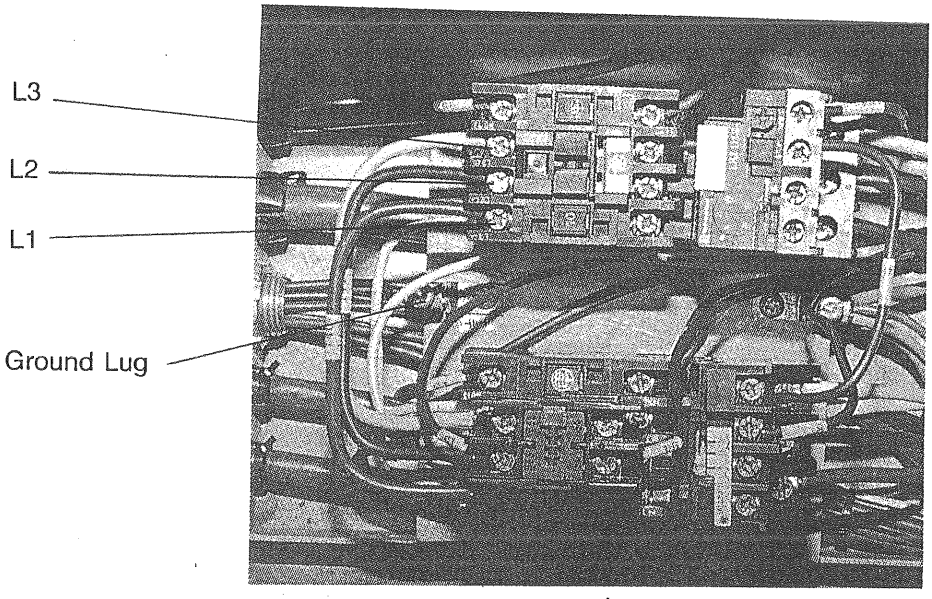


Fig 1-3

HYDRAULIC OIL AND CUTTING FLUID

The S-20A bandsaw is supplied with Shell Tellus 46 hydraulic oil. If it is necessary to change the oil to a different brand see the HYDRAULICS SECTION for an equivalent grade oil.

No cutting fluid 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 the manufacturer.

SUB SECTION 2A — CONTROLS AND OPERATIONS

THE CONTROL CONSOLE

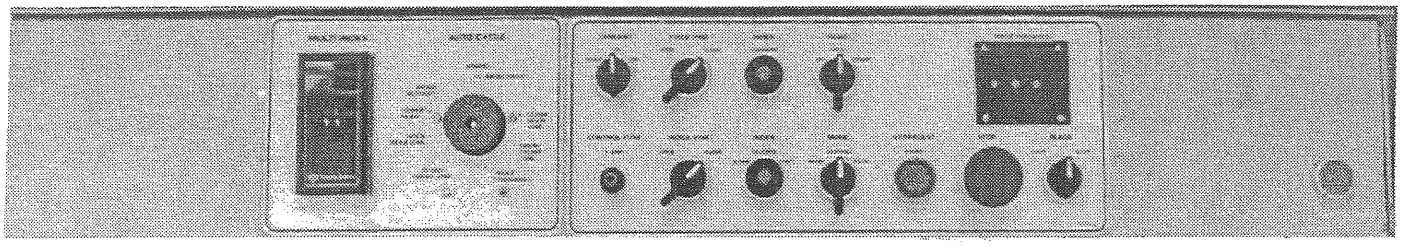


Fig 2A-1

START-UP

The S-20A control console has been designed to simplify the operation of the saw, to give the operator the ability to stop any time, and to be able to control all the functions remotely. (See Fig 2A-1)

We can not overstress the importance of familiarizing yourself with the controls of the S-20A prior to starting the machine.

NOTE: WHEN STARTING THE S-20A FOR THE FIRST TIME *MAKE SURE* THAT THE MODE SELECTOR SWITCH IS IN ITS *NEUTRAL* POSITION, THE BLADE IS MOVING IN A *COUNTERCLOCKWISE DIRECTION*, AND THAT THE HYDRAULIC PRESSURE IS *475 PSI*.

HYDRAULIC START BUTTON: Starts hydraulic pump motor, energizes the MODE SWITCH and BLADE START/STOP SWITCH.
The fixed vise will open or close according to its selector switch position.
Reactions of the functions depend upon MODE SWITCH position.
The HYDRAULIC START BUTTON is inactive if the PIECE COUNTER is set at zero. The switch is illuminated whenever the hydraulic pump motor contactor is engaged.

STOP BUTTON: Stops both hydraulic and blade motors and de-energizes MODE SWITCH.
Head and shuttle motion will cease.
Vise will remain as it is, but if closed, it will gradually lose its gripping force.

BLADE START/STOP SWITCH: Is inoperative unless hydraulics are running. Momentary counterclockwise rotation of the switch starts the blade motor.
Momentary clockwise rotation of the switch stops the blade motor.

MODE SWITCH: Has three positions, MANUAL, NEUTRAL and AUTO.

MANUAL: in manual all the following function switches are operative, the AUTO CYCLE DIAL is inoperative.

NEUTRAL: only the FIXED VISE SWITCH and the COOLANT SWITCH are operative.

AUTO: all of the functions are under the control of the AUTO CYCLE DIAL, and the MANUAL CONTROL switches are inoperative.

HEAD CONTROL SWITCH: Inoperative unless MODE SWITCH is in MANUAL.

UP: the head will rise until it reaches the HEAD UP LIMIT SWITCH SETTING.

HOLD: the head will remain stationary

DOWN: the head will descend until it reaches the bottom. Descent is controlled by the FEED RATE and FEED FORCE controls of the positive downfeed.

INDEX FORWARD BUTTON: Button is inoperative except when MODE SWITCH is in MANUAL.

Depressing this button fully will cause the shuttle table to quickly advance toward the saw table until the button is released or the shuttle reaches the forward limit of travel.

Depressing this button partially will cause the shuttle table to advance toward the saw table at a very slow rate until the button is released or the shuttle reaches the forward limit of travel. This control is intended to assist in the accurate positioning of heavy pieces of stock.

INDEX REVERSE BUTTON: Button is inoperative except when MODE SWITCH is in MANUAL.

Depressing this button fully will cause the shuttle to retract away from the saw table until the button is released or the shuttle reaches the rearward limit of travel.

About 1/2" before the rearward limit is reached the shuttle will suddenly slow down, and continue to the limit at a reduced speed. The button should be held momentarily after the shuttle appears to have stopped to ensure it has reached the rearward limit of travel.

Depressing this button partially will cause the shuttle to retract away from the saw table at a very slow rate until the button is released or the shuttle reaches the rearward limit of travel. This control is intended to assist in the accurate positioning of heavy pieces of stock.

INDEX VISE SWITCH: Switch is inoperative except when MODE SWITCH is in MANUAL.
In OPEN the index vise cylinder is fully retracted.
In CLOSE the index vise cylinder is fully extended.
Cylinder travel is about 3 inches, and selecting the CLOSE position will not clamp the workpiece unless the vise cylinder is properly located for the workpiece in use. This applies equally to the fixed vise.

FIXED VISE SWITCH: This switch is operative as long as the machine is supplied with power. Unlike the other function switches it is active when the MODE SWITCH is in NEUTRAL. The FIXED VISE SWITCH is wired this way to insure that the fixed vise will not release the workpiece when switching between AUTO and MANUAL, or if the saw should shut down during a cut due to a motor overload. This security is provided only if the FIXED VISE SWITCH is left in the CLOSE position during automatic operation; the AUTO CYCLE DIAL will open the front vise as required. The FIXED VISE SWITCH should be turned to OPEN when shutting the saw down for a prolonged period of time (ie. overnight). When this switch is in CLOSE position, the fixed vise will stay closed even when shutting the saw down with the STOP BUTTON, but the vise pressure will quickly drop off and it should not be relied upon to hold unbalanced workpieces after shutdown.

COOLANT SWITCH: Has three positions ON, WASH and OFF

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 the machine.

OFF: no coolant flow

AUTO CYCLE DIAL: This knob rotates in a clockwise direction when the saw is running and the MODE SWITCH is in AUTO.
As it rotates it sends out control commands indicated on the dial. Whenever the head or shuttle motion is initiated, the dial will stop and wait for the motion to reach the end of its travel, and then it will resume its rotation.

It is recommended that the AUTO mode always be initiated with the AUTO CYCLE DIAL in the START position. This will result in the fixed vise closing, the index vise opening, the head lowering (unless already down), and the shuttle table retracting (unless it is already retracted). The head will then rise to the limit set by the HEAD UP LIMIT SWITCH and the cycle will proceed in order as on the dial. When manually positioning the AUTO CYCLE DIAL, it should always be turned in the clockwise direction. NEVER TURN DIAL COUNTERCLOCKWISE.

MULTI INDEX COUNTER: The counter is operative only in the AUTO mode. The number on the manually set thumbwheel display controls the number of shuttles made by the shuttle table between each saw cut. If the setting is changed during the shuttling portion of the auto cycle the new setting will not be accepted until after the current cutting cycle. Thus if a high number is entered in (ie. 25) the saw must be stopped to cancel the setting without having the stock shuttled completely through the machine.

PIECE COUNTER: The counter is operative in both AUTO and MANUAL. It is manually set to the number of cuts desired and counts down to zero at which point it turns the saw off. If the counter is set at zero it will not permit the saw to be started. If in the MANUAL mode it is desired to have the saw shut down at the end of the cut, the PIECE COUNTER must be set to 1 (one) before the cut. The counter counts one half count when the head down signal begins and the other half when the head down signal ends. Thus if the auto cycle is interrupted during cutting a false count will be recorded. In this event simply push the PIECE COUNTER back up one count.

OPTIONAL PLC CONTROL CONSOLE

START-UP

The S-20A control console has been designed to simplify the operation of the saw, to give the operator the ability to stop any function at any time, and to be able to control all the functions remotely. (See Fig 2A-2 and Fig 2A-3)

We can not overstress the importance of familiarizing yourself with the controls of the S-20A prior to starting the machine.

NOTE: WHEN STARTING THE S-20A FOR THE FIRST TIME *MAKE SURE* THAT THE MODE SELECTOR SWITCH IS IN ITS *NEUTRAL* POSITION, THE BLADE IS MOVING IN A *COUNTERCLOCKWISE DIRECTION*, AND THAT THE HYDRAULIC PRESSURE IS *475 PSI*.

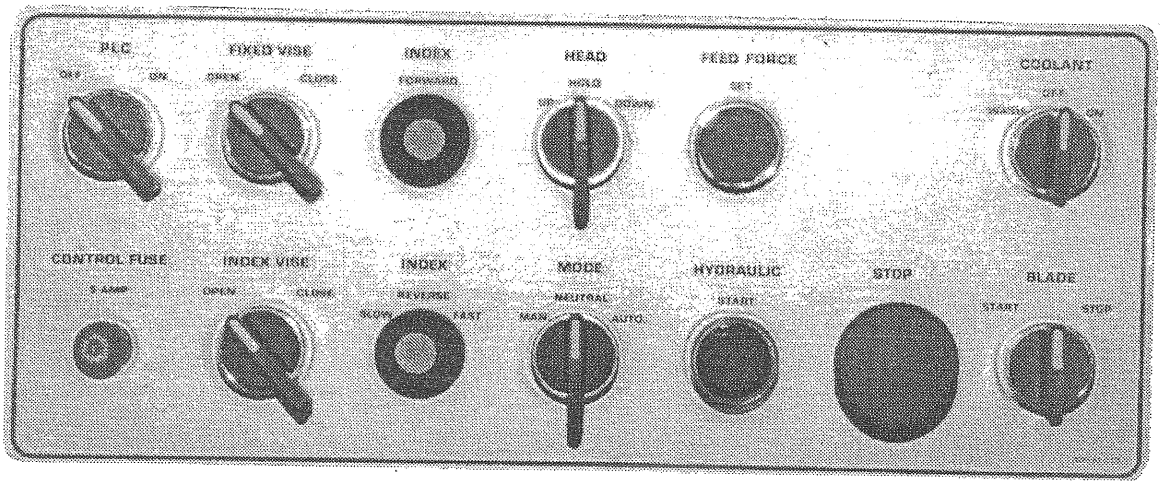


Fig 2A-2 Manual Operation Control Panel

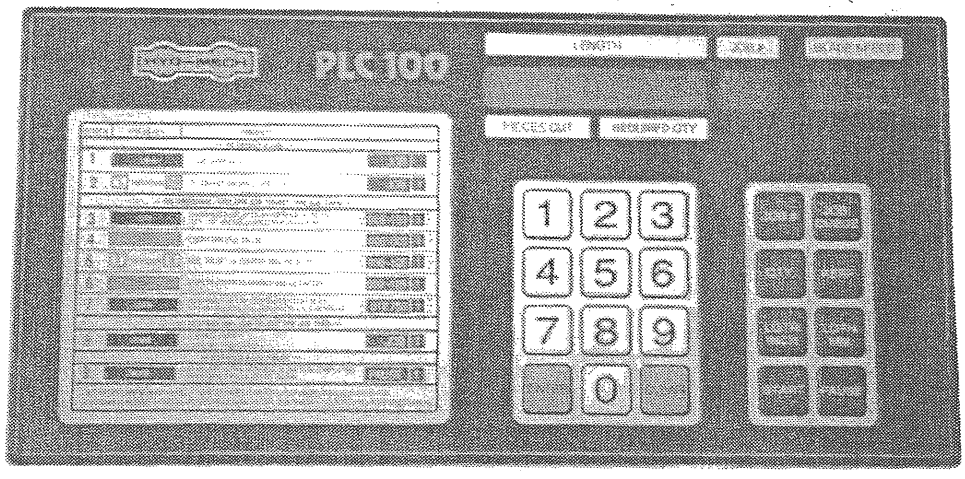


Fig 2A-3 Automatic Operation Programming Panel and "electronic tape measure" display in manual mode.

PLC CONTROL SYSTEM IN MANUAL MODE

In manual mode the PLC can be used as an "electric tape measure" in the following manner:

OPERATORS ACTION:	PLC DISPLAY STATUS AND COMMENTS:
1. Set PLC switch to on. Load the saw, do a trim cut, and bring the machine to "Home Position" which is: The front vise closed. The shuttle fully forward with the shuttle vise open, and head up.	X.XXX L The L indicates that PLC is functioning as a length display. Three digits to the right of the decimal indicate the length is being displayed in inches.
2. Press CLEAR	0.000 L
3. Retract shuttle vise to proper piece length plus blade kerf. Example: Req'd piece length = 15" Blade kerf = .065"	15.065 L Display responds to shuttle movements but only when shuttle vise switch is in **OPEN** or **NEUTRAL** position. Number shown on display will increase when shuttle is retracting and decrease when shuttle is advancing.
4. Close shuttle vise.	15.065 L Closing the shuttle vise freezes the display which no longer responds to shuttle movements for as long as the shuttle vise remains closed.
5. Move the shuttle fully forward (advance the stock).	15.065 L Stock has been advanced.
6. Make a cut.	15.065 L Cut off piece should measure 15.00".
7. Press CLEAR	0.000 L
8. Open shuttle vise.	

Next measured cut can be started by repeating the sequence, step 3 - step 8.

NOTE:

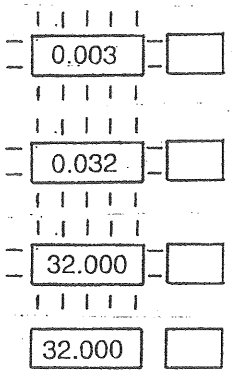
If the desired part length is greater than the full shuttle stroke, simply perform the steps outlined above, retracting the full length of the shuttle in step 3. After step 5, open the shuttle vise and retract again until the display reads the desired shuttle length (desired part length plus the blade kerf). This multiple shuttle process can be repeated as many times as necessary to reach the desired part length. Because the PLC only records and displays the total retracting motion of the shuttle, with the shuttle vise open, it will accurately indicate the resulting stock advance, provided only that the last advance of material ends with the shuttle fully forward.

PLC CONTROL SYSTEM IN AUTOMATIC MODE - SINGLE JOB

For the machine to operate in fully automatic mode, the PLC must be programmed in the following manner:

OPERATORS ACTION:	PLC DISPLAY STATUS AND COMMENTS:
1. Set **MODE** switch to **MAN**	[ ] [ ] Display not active.
2. Set head up limit.	
3. Make a trim cut.	
4. Set PLC switch to **ON**	X.XXX L
5. Set **MODE** switch to **AUTO**	Machine hydraulics will shut off.
6. Press JOB	JOB [ ] JOB 01
7. Assign number to a job by pressing required digit on PLC panel Example: [1] was depressed	
8. Press QTY	032-050 01 Display flashes. Right numbers represent required quantity of cuts. Left numbers represent quantity that has been already cut. In the above example, 32 pieces are cut of 50 required from JOB 1.
9. Press CLEAR	000-000 01
10. Enter required number of cuts. Example: Required number of cuts = 75 - Press [7]	000-007 01
- Press [5]	000-075 01
- Press ENTER	000-075 01 Display stops flashing.
11. Press LENGTH / INCH once	12.435 01 Display flashes. Number shown is left over from last operation.
12. Press CLEAR	.000.000 01

13. Enter required piece length
    Exmaple: Required piece length = 32''
    - Press [3] once
    - Press [2] once
    - Press [0] three times
    - Press [ENTER]



Display stops flashing.

14. Press [START]

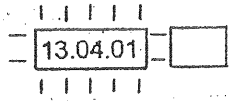
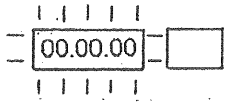
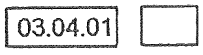
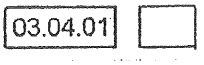
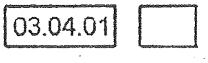
Machine is ready to be started.

15. Press [HYDRAULIC START] push button on Manual Operation Panel

Hydraulics will start and machine will bring itself to ''home position''.
As soon as ''home position'' is found the machine will execute the job in automatic mode. After the job is completed the machine will shut itself off.

PLC CONTROL SYSTEM IN AUTOMATIC MODE IN MULTI JOB

The PLC can be programmed to do 29 jobs, 3 jobs in Que. Programming each individual job is as outlined above. Programming ''Run-que'' (sequence of jobs) is done in the following manner:

OPERATORS ACTION:	PLC DISPLAY STATUS AND COMMENTS:
1. Press [JOB QUE]	
2. Press [CLEAR]	
3. Enter required job sequence. Example: Job 3 as first Job 4 as second Job 1 as third	
4. Press [ENTER]	
	Display stops flashing
5. Set **MODE SWITCH TO AUTO**	
6. Press [START]	
7. Press **HYDRAULIC START** push button on manual operation panel.	Hydraulics will start and machine will bring itself to ''home position''. As soon as home position is found the machine will execute the automatic mode. After all the jobs are completed in the RUN QUE the machine will shut itself off.

IMPORTANT NOTES WITH RESPECT TO PLC OPERATION

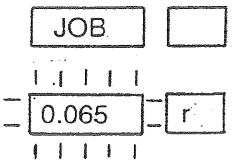
1. INTERUPTING THE AUTO CYCLE

In case the machine auto-cycle needs to be interrupted one of the following steps need to be taken depending on the situtation.

OPERATORS ACTION:	PLC DISPLAY STATUS AND COMMENTS:
- Press STOP button	32.065 [ ]
	Machine hydraulics and blade will stop immediately. Display will not be affected and will show: length, (when machine was stopped and the head was not in the up position), or required quantity and quantity already cut, (when machine was stopped with the head in the up position).
To resume machine operation switch MODE switch to MANUAL	32.065 [L]
Start the machine hydraulics and blade.	
Turn MODE switch to AUTO	32.065 [L]
PRESS [START]	32.065 [01]
	machine will resume and complete the job.
- Switch MODE switch to neutral	32.065 [L]
	Machine will stop its operation but the hydraulics and blade will remain running.
To resume machine auto operation turn the MODE selector switch to AUTO	PAUSE [01]
Press [START]	32.065 [01]
	Machine will resume its operation.
- Press [PAUSE]	PAUSE [01]
	Machine may not stop immediately. It will continue its head or shuttle movement until shuttle or head reaches its extreme position then stops.
To resume machine auto operation.	
Press [START]	32.065 [01]
	Machine will resume and complete the job.

2. ENTERING BLADE KERF

Press JOB

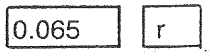


Pressing KERF

Will allow you to enter blade kerf.

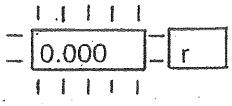
Display flashes shows value entered earlier.

Press ENTER if shown value is correct



or

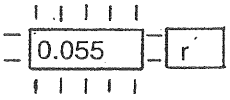
Press CLEAR



and enter proper value.

Example: Kerf = .055

Press 5 and 5

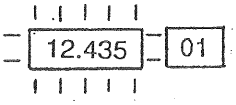


Press ENTER

Entering the kerf needs to be done only once (provided that the same blade style is used.)

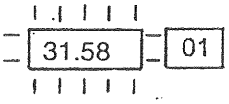
3. INCH — METRIC INPUT OR MEASURING

Press LENGTH / INCH



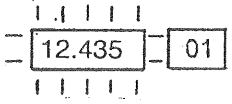
If there are 3 digits to the right of the decimal; length is being displayed in inches.

Press LENGTH / mm



The same length as above (12.435") is being displayed in centimetres. This is recognized by having only 2 digits to the right of decimal.

Press LENGTH / INCH



The length is displayed in inches once again.

SUBSECTION 2B — SAW CUTTING CONTROLS

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

BLADE BASICS

Technology is rapidly changing all aspects of production machining. Metal cut-off 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 5/8 or 4/6 bi-metal blade supplied with the S-20 series saws) 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*. (Utilizing a very slow blade speed is recommended.)

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

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

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

VARIABLE SPEED CONTROL

Blade speed can be adjusted infinitely between 75 to 400 SFM (Surface Feet/Minute). Adjustment should be made only when the blade is running. Clockwise rotation of knob "A" increases the blade speed while counterclockwise rotation decreases blade speed.

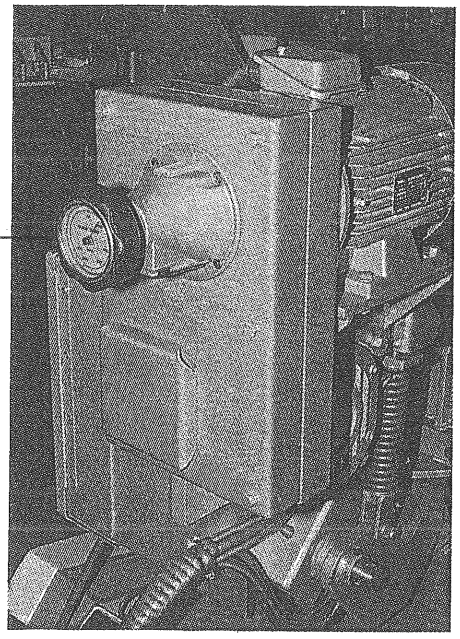
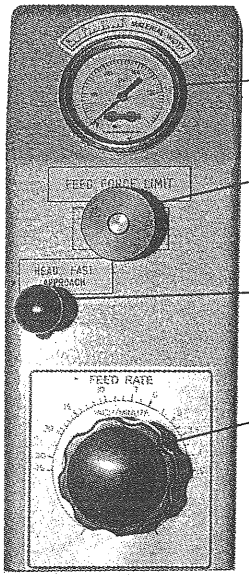


Fig 2B-1

HYDRAULIC FEED CONTROL

The Hydraulic Feed Control is located beside the drive wheel box.

These controls allow independent control of FEED FORCE and the FEED RATE.



Feed Force Gauge

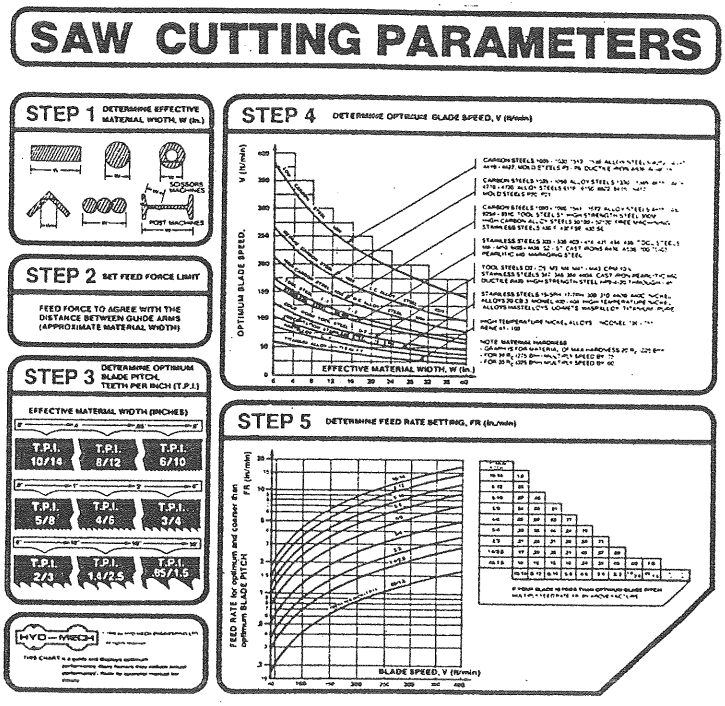
Feed Force Knob
Used to set Feed Force Limit (clockwise rotation to increase and counterclockwise rotation to decrease).

Fast Approach Lever
Depress for fast head descent

Feed Rate Knob with feed rate scale (calibrated in inches/minute)
Used to set Feed Rate (counterclockwise rotation to increase and clockwise rotation to decrease).

Fig 2B-2

USING THE SAW CUTTING PARAMETERS ON DOOR CHART



A full size DOOR CHART is mounted on the drive door of the saw.

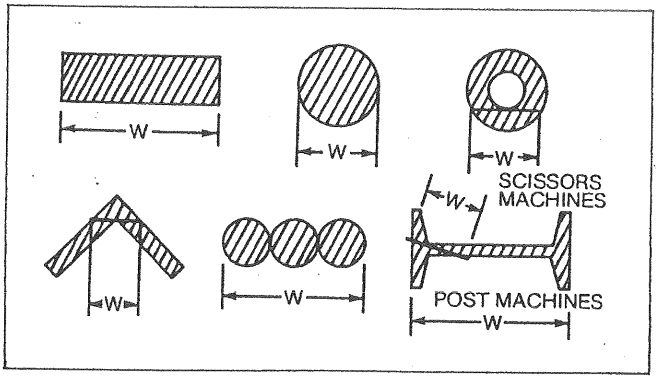
The chart contains 5 steps for the operator to follow in order to achieve optimum performance of the saw.

Fig 2B-3

As Example #1 we will use the DOOR CHART to set up the saw, for cutting 8'' Diameter, 1045 Carbon Steel.

STEP 1

DETERMINE EFFECTIVE
MATERIAL WIDTH, W (in.)



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. For these cases effective width is 60% to 75% of actual material width.

Fig 2B-4

NOTE:
Both effective material width and guide arm width are used in setting the saw.
Guide arm width is the distance between the guide arms and is used in STEP 2.
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" diameter solid, effective material width is 8".

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 workpiece. The controls for setting the Feed Force Limit consist of:

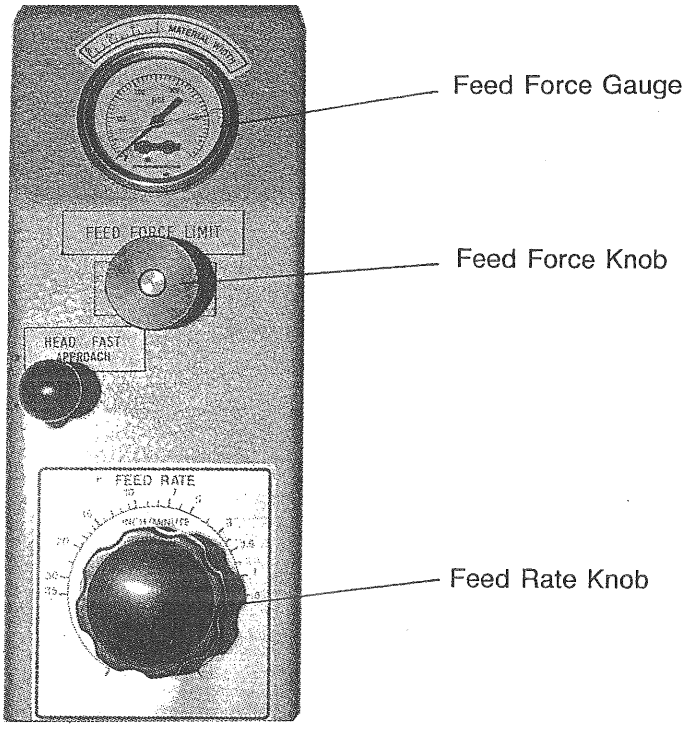
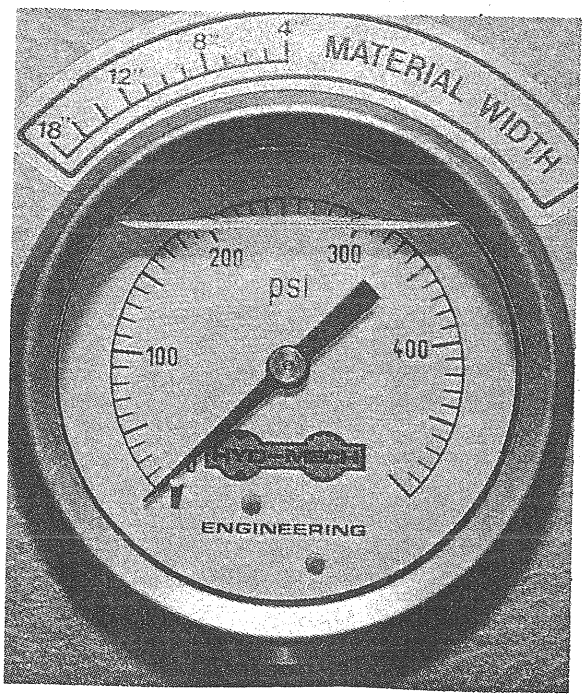


Fig 2B-5

*Feed Force Setting Button located on Main Control Panel Face

To set FEED FORCE LIMIT:

- With the Mode Switch in "manual" position, move the head fully down.
- After the head is down, open the feed rate valve, depress Feed Force Setting button, and adjust the FEED FORCE.



Example #1

1" Blade

8" Material Width

225 PSI Feed Force*

Example #2

1 " Blade

4" Material Width

250 PSI Feed Force*

Fig 2B-6 Feed Force pressure setting range for 1" blade.

* These values have been calculated on the assumption that the adjustable guide arm is as close to the material as possible.

  In cases when the guide arm is not as close as recommended, allowable Feed Force pressure should be set to a lower value (as it would be for wider material).

SIGNIFICANCE OF GAUGE READING:

With the head down and yellow button depressed the (FEED FORCE "set" on manual control panel) FEED FORCE gauge indicates the setting of the FEED FORCE LIMIT. During cutting the gauge shows the actual force being applied by the blade to the workpiece.

In typical cutting situations, the needle on the gauge will rise towards the preset FEED FORCE LIMIT and stabilize, usually at a lower level. If the material being cut is very hard or wide, the needle may rise all the way to the preset FEED FORCE LIMIT, which it will not exceed.

When cutting soft materials and or narrow cross sections, the gauge reading may be low, but the FEED RATE will be maintained. Any changes during cutting, such as, material hardness or material cross sections will influence the gauge readings. Therefore, in some cutting situations the gauge reading may rise and fall. A very low gauge reading is usually observed when the blade is approaching the material to be cut, but not yet cutting.

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 (see Fig 2B-7 below).

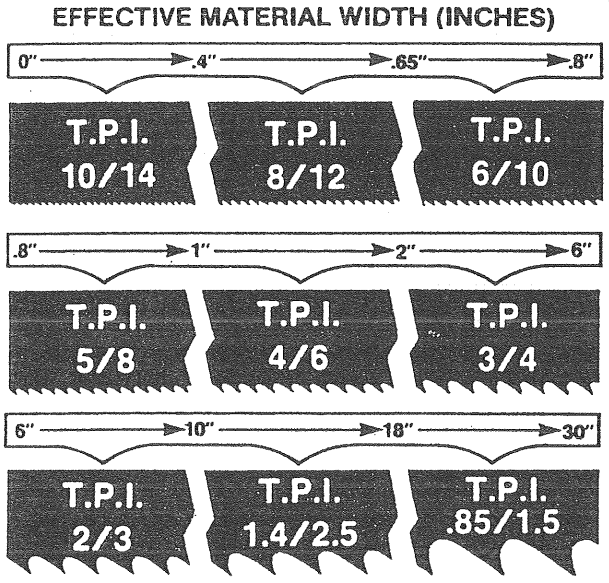


Fig 2B-7 Optimum blade pitch, teeth per inch (T.P.I.) for effective material width, W (in.).

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, for an effective material width of 8'' the optimum blade has 2/3 teeth per inch.

STEP 4

DETERMINE OPTIMUM BLADE SPEED, V (ft/min)

The relationship between optimum blade speed and effective material width for various materials is represented on the graph Fig 2B-8.

Example #1

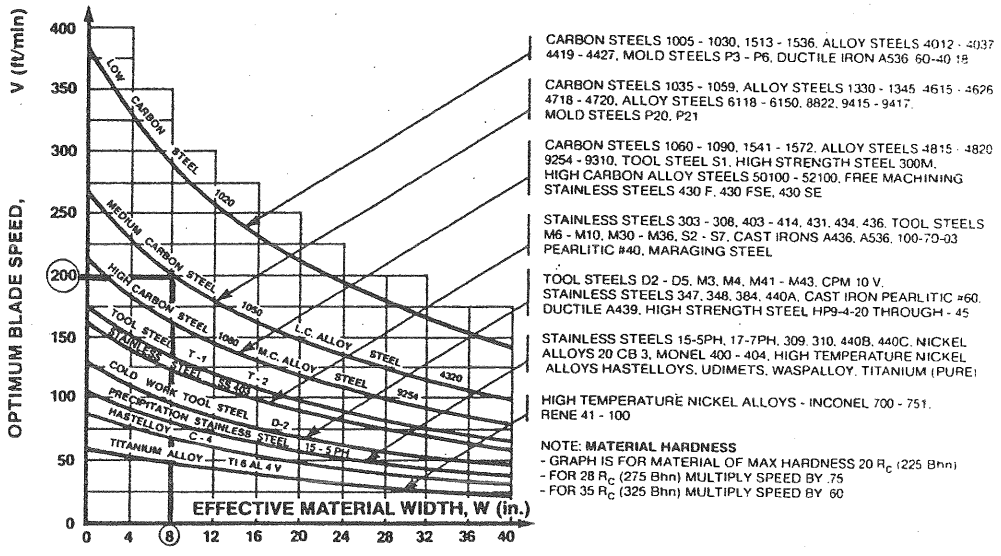


Fig 2B-8 Optimum blade speed curves.

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

In Example #1 8" dia, 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 speed for 1045 Carbon Steel.
- On the horizontal axis (effective material width axis) find number 8 which represents effective material width of an 8" diameter solid.
- Find the point where a vertical line from 8" 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".
- Thus, for 8" diameter, 1045 Carbon Steel solid bar 200 ft/min is the optimum blade speed.

NOTE: 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.

The table below shows a few examples of optimum blade speeds for different materials.

TABLE 2B-1

NO.	MATERIALS	OPTIMUM BLADE SPEED (ft/Min.)
1	5" Dia. Solid, 1045 Carbon Steel	225
2	12" I-Beam	290
3	4" x 4" Rectangular Tube, 1/4 Wall	350
4	4" Dia. 403 Stainless Steel	140
5	2" x 2" Rectangular Tube, 1/8 Wall Bundle cut, 5 pcs. x 5 pcs. (A 10" x 10" Bundle)	325
6	3" x 3" Solid - Inconel	60

NOTE: About Material Hardness

The Graph - Step 4, Fig 2B-8, illustrates blade speed curves for materials of hardness 20 Rc (225 Bhn) or lower.

If the material is hardened, use multipliers from the NOTE (near the bottom) of the Graph.

For example, if the 5" diameter, 1045 Carbon Steel material, from the table above, had been hardened to 35 Rc (325 Bhn) then we must multiply the blade speed of 225 ft/min by .60.

Thus 225 ft/min x .60 = 135 ft/min. (This is the optimum blade speed for 5" diameter, 1045 Carbon Steel, 35 Rc hard).

STEP 5

DETERMINE FEED RATE SETTING, FR (in/min)

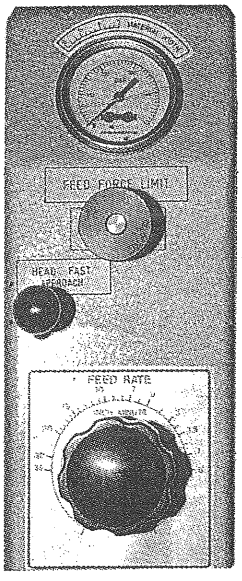


Fig 2B-9

FEED RATE is the vertical speed at which the blade descends through the workpiece.

FEED RATE Knob controls FEED RATE of the blade in the range 0 to 35 in/min.

The FEED RATE should be adjusted only in one direction (from "0" to required value). If you go too far, go back to "0" and come back up.

To set FEED RATE for particular cutting situations use the Graph, Fig 2B-10, which represents the relationship between FEED RATE, blade speed and blade pitch.

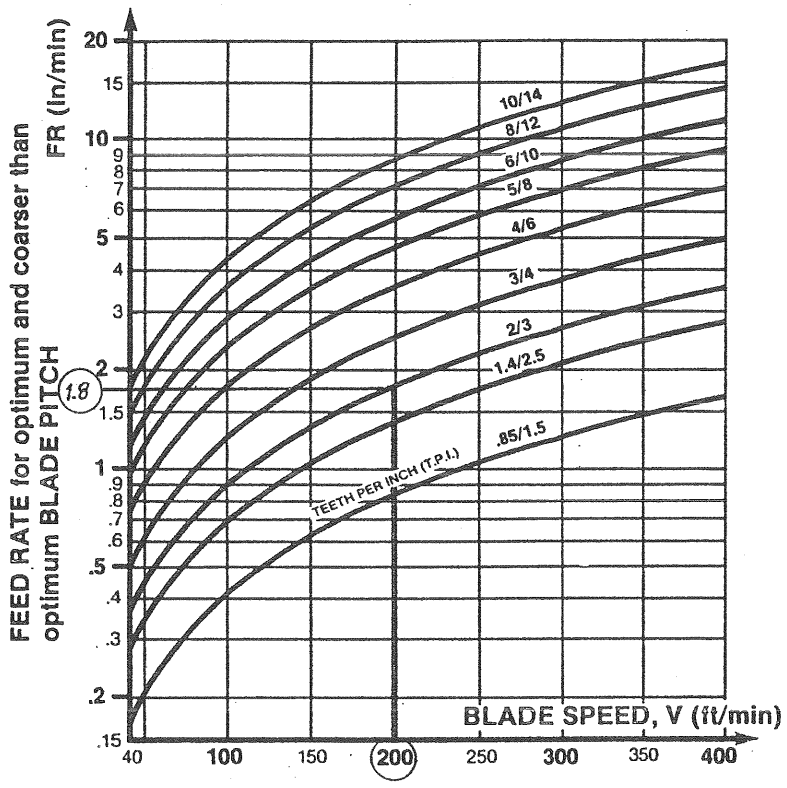


Fig 2B-10

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. From the Graph, Fig 2B-10 the FEED RATE is determined in the following way:

- On the horizontal axis (blade speed axis), find 200 ft/min.
- Find the point where a vertical line from 200 ft/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 FEED RATE.

Thus 1.8 in/min is the FEED RATE for cutting 8'' diameter, 1045 Carbon Steel when the optimum 2/3 pitch blade is used.

If the machine is fitted with a blade coarser than optimum (eg. 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 for this blade.

If however, the machine is fitted with a finer than optimum blade (eg. 3/4 TPI) we use the graph for the optimum blade as before, and then use a multiplier given by the table 2B-2.

TABLE 2B-2

OPTIMUM PITCH	10/14	8/12	6/10	5/8	4/6	3/4	2/3	1.4/2.5	.85/1.5	ACTUAL PITCH
10/14	1.0									
8/12	.83									
6/10	.67	.80								
5/8	.54	.65	.81							
4/6	.42	.50	.63	.77						
3/4	.29	.35	.44	.54	.70					
2/3	.21	.25	.31	.38	.50	.71				
1.4/2.5	.17	.20	.25	.31	.40	.57	.80			
.85/1.5	.10	.12	.15	.18	.24	.34	.48	.60	1.0	

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

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

As a result we find that we must decrease our FEED RATE of 1.8 in/min by factor .71.

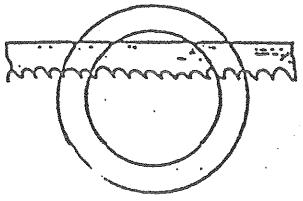
In this case we should use FEED RATE 1.8 in/min x .71 = 1.3 in/min.

CUTTING CONTROL SET UP EXAMPLES

FOR EXAMPLES #2 AND #3 PLEASE GO TO THE SAW AND FOLLOW STEPS 1-5 ON THE DOOR CHART:

Example #2

Material to be cut



- Round Steel Tube
  SAE 4320
  6" OD x 4" ID
- Hardened to 35Rc (325 Bhn)

STEP 1

Effective Material Width: 4 1/2" (.75 X 6)

STEP 2

Feed Force limit setting for 6" Diameter material: 180 P.S.I.

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 material width: 225 ft/min

Blade speed reduced by hardness factor: 225 ft/minX.60 = 135ft/min

STEP 5

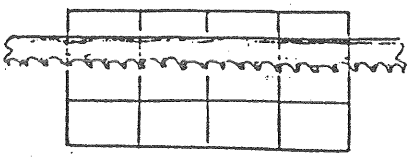
Feed Rate for 3/4 TPI blade: 1.8 in/min

Feed Rate for 4/6 TPI blade: 1.8 in/minX.70 = 1.3in/min
(reduced by finer than optimum blade pitch factor, Table 2B-2 - STEP 5)

Example #3

Material to be cut

- low carbon steel
- 2'' x 2'' tube x 1/4'' wall



- clamped in vises 12 pcs in a bundle (6'' x 8'')

STEP 1

Effective material width — 5'' (.6 x 8'')

STEP 2

Feed Force limit for 8'' wide material: — 180 P.S.I.

STEP3

Optimum blade pitch for 5'' effective material width: — 3/4 T.P.I.

STEP 4

Optimum blade speed for 5'' effective material width — 320 ft/min

STEP 5

Feed Rate: — 4.0 in/min

SUBSECTION 2C — MECHANICAL CONTROLS

HEAD UP AND HEAD DOWN LIMIT SETTING

Head Up Limit - In order to maximize production in the automatic cycle the HEAD UP LIMIT should be set to match the height of the material. By adjusting the HEAD UP LIMIT SETTING KNOB the head can be set to rise just above the material eliminating unnecessary head travel in the cycle and therefore shortening the cycle time.

To Set Limit- For coarse adjustment depress button "A" and slide knob "B" up or down to approximately the desired height. To finely adjust the height turn knob "B". Clockwise rotation of the knob raises the upper limit of the head travel and counterclockwise lowers the limit of head travel.

The head up limit should be set by starting with the head below the required height and the knob turned to contact the limit switch.

MANUAL mode must then be selected and the HEAD UP LIMIT KNOB rotated clockwise until the blade has at least 1/2" clearance above the material and slightly more when cutting bundles.

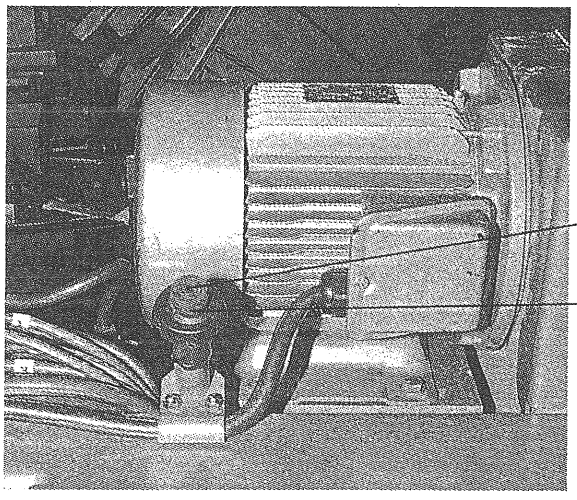


Fig 2C-1

Head Down Limit Switch- Stops the coolant pump when the cut has been completed. The exact instant it shuts off the power supply can be set by the adjustment bolt "A". NOTE: This limit is factory set and under ordinary cutting requirements setting should not be changed. If changed it may cause the machine to malfunction in the auto cycle.

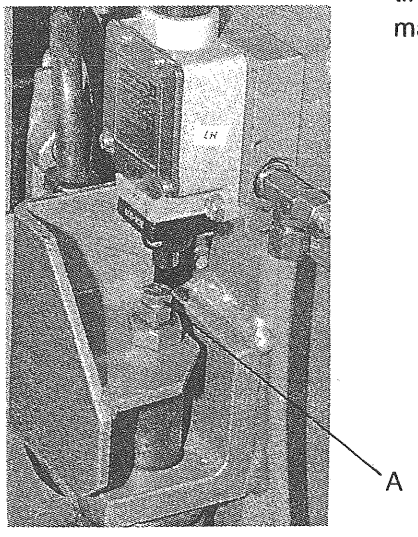


Fig 2C-2

HEAD SWING

The swing head allows for angled cuts between 90° and 45°. Once the angle is set, the swing head is locked in position by depressing the angle brake lever, Fig 2C-3. The brake must be locked during cutting. To reset to 90° release angle brake and swing head back against the 90° stop bolt located on the vise cylinder post.

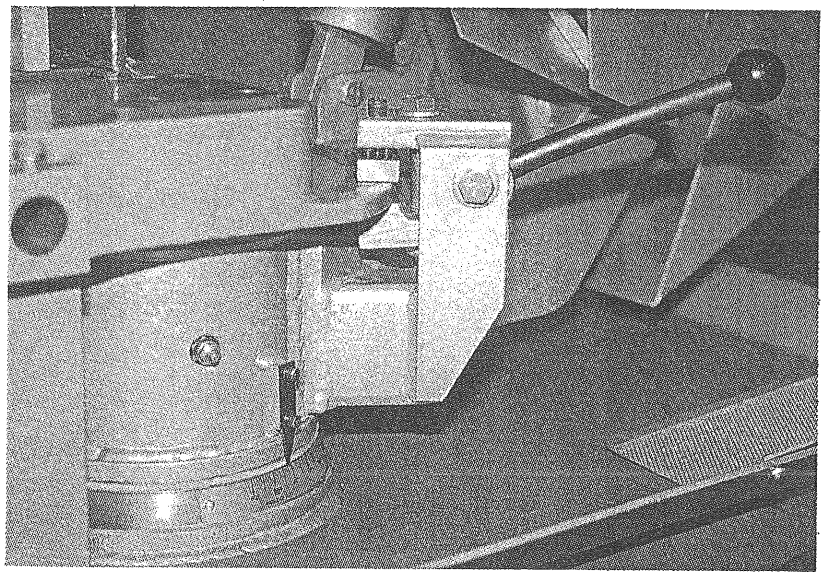


Fig 2C-3

SHUTTLE LENGTH CONTROL (Standard Length Control)

The length of shuttle travel is indicated on the ruler by a small pointer on the adjusting block, when the shuttle is fully forward and the micrometer is set to exactly midscale, .250 inch on the 1/2 inch micrometer.
The micrometer is provided to facilitate fine adjustments which are not possible by moving the entire adjusting block.

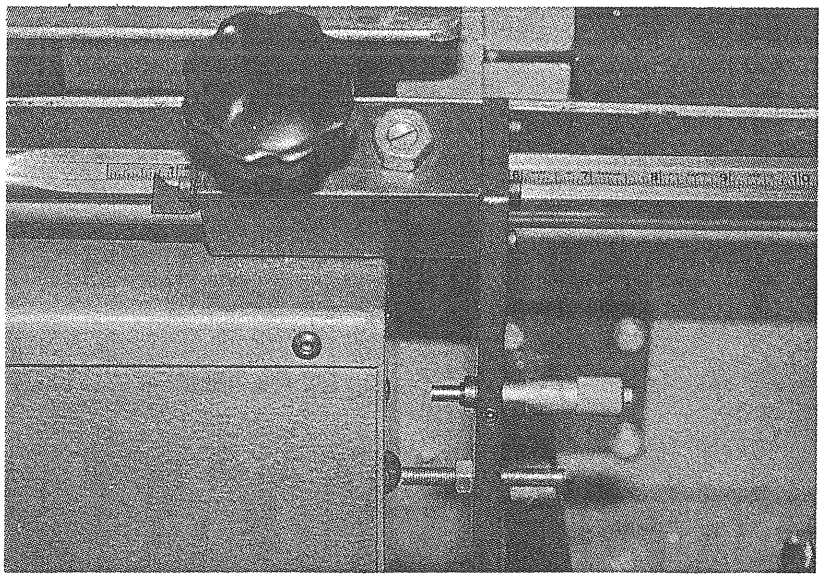


Fig 2C-4

CONVENTIONAL LENGTH CONTROL SET-UP AND CALIBRATION

The calibration makes no allowance for kerf loss (about .050 inch) and this must be added by the operator. The procedure is as follows:

To the desired piece length add the kerf allowance. If the resulting length is less than 16 inches, fully advance the shuttle and set the adjusting block pointer to the resulting length. Set the MULTI INDEX COUNTER to 1".

If the resulting length is greater than 16 inches, divide it by the smallest number which will result in dividend less than 16 inches. Fully advance the shuttle and set the adjusting block pointer to the resulting dividend. Set the MULTI INDEX COUNTER to the divisor.

Example 1

Desired piece length		9 3/4 inch
+ Kerf	Approx.	1/16 inch
= Total shuttle required		9 13/16 inch

Less than 16 inches? Yes.
Set the adjusting block pointer to a 9 13/16 inch and the Multi Index Counter to "1".

Example 2

Desired piece length	33 3/8 inch
+ Kerf	1/16 inch
= Total shuttle required	33 7/16 inch

Less than 16 inches? No.
We must divide by 3 in order to get a dividend less than 16 inches.

$33.4375 \div 3 = 11.146$

Set the adjusting block pointer to 11 5/32 inch and the Multi Index Counter to "3".

It is wise to make a trial cut in order to check the accuracy of the length setting. Start by being certain that the head up limit switch and the vises are correctly set up for the workpiece. Using the manual mode, raise the head fully and advance the stock and make a clean-up cut.

On completion of this cut, set the Piece Counter to "1" and the **Auto Cycle Knob to start.** Switch to the "auto" mode. The head will rise, the stock will advance, and a single cut will be made.

Check the length of this piece. If it is not accurate enough, use the micrometer head to "zero in" on exactly the length you require. The general procedure for using the micrometer length adjustment is as follows:

$$\text{NEW MICRO SETTING} = \text{OLD MICRO SETTING} + \left(\frac{\text{DESIRED LENGTH} - \text{ACTUAL LENGTH}}{\text{NUMBER OF INDEXES}}\right)$$

If, in example 1, the resulting piece was 9.775 inches rather than tne desired 9.750 inches then

$$\text{NEW MICRO SETTING} = .250 + \frac{9.750 - 9.775}{1}$$
$$= .250 + (-.025)$$
$$= .225$$

If, in example 2, the resulting piece was 33.313 inches rather than the required 33.375 inches then

$$\text{NEW MICRO SETTING} = .250 + \frac{33.375 - 33.313}{3}$$
$$= .250 + \frac{.062}{3}$$
$$= .271$$

In general, remember, increasing the micrometer setting increases the part length, while decreasing the micrometer setting decreases the part length.

*NOTE: Remember to reset the micrometer to exactly midscale at the end of each run.

To recap the steps you should follow in sequential order when setting up to do a production run,

1. Load stock.
2. Set-up vise.
3. Set-up head height.
4. Take a clean-up cut in "manual" mode.
5. Set required stock length with adjustment block.
6. Take one cut in "auto" mode.
7. Check stock length and make required adjustment with micrometer.
8. Set PIECE COUNTER to number of pieces required.
9. Switch to "Auto" and begin your run.

VISE POSITIONING

To set-up the vise for holding the desired stock, first select the vise OPEN position on the vise control switch. Next, slide the vises up against the stock and then pull back until the pin on the tail of the cylinder falls into its appropriate hole. This will allow the vise to contact the stock before the vise cylinder reaches its full stroke. Be sure that both fixed and shuttle vises are set-up properly to ensure stock is indexed to the correct length.

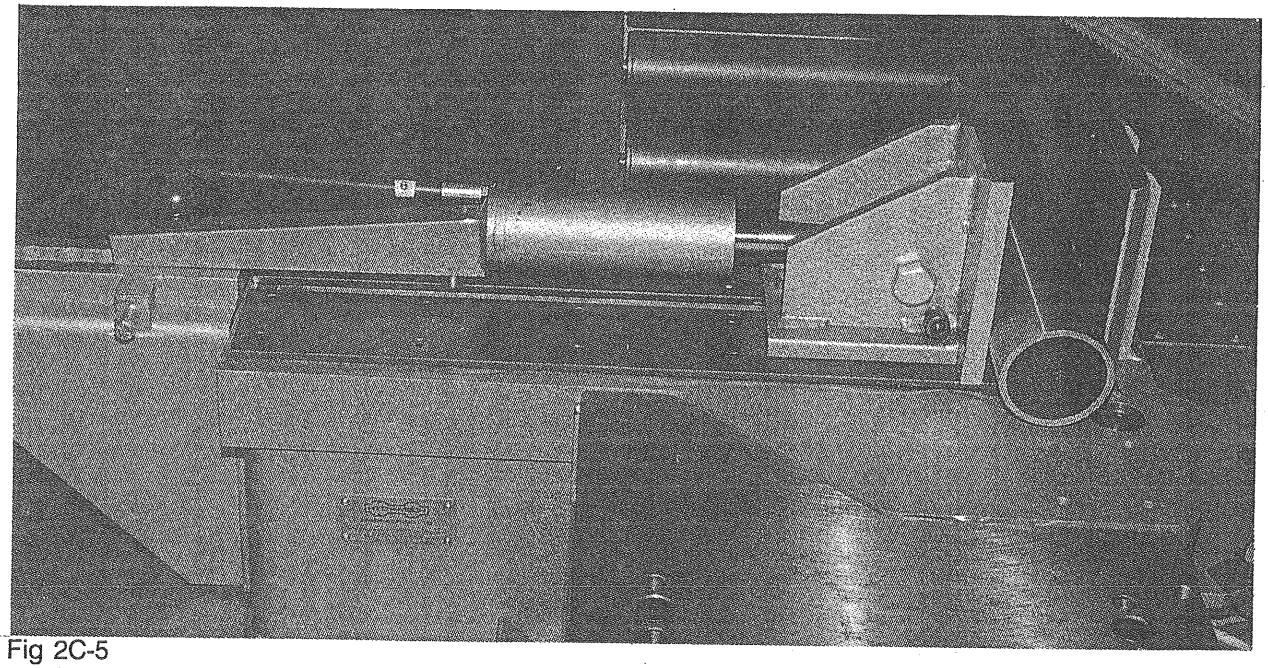
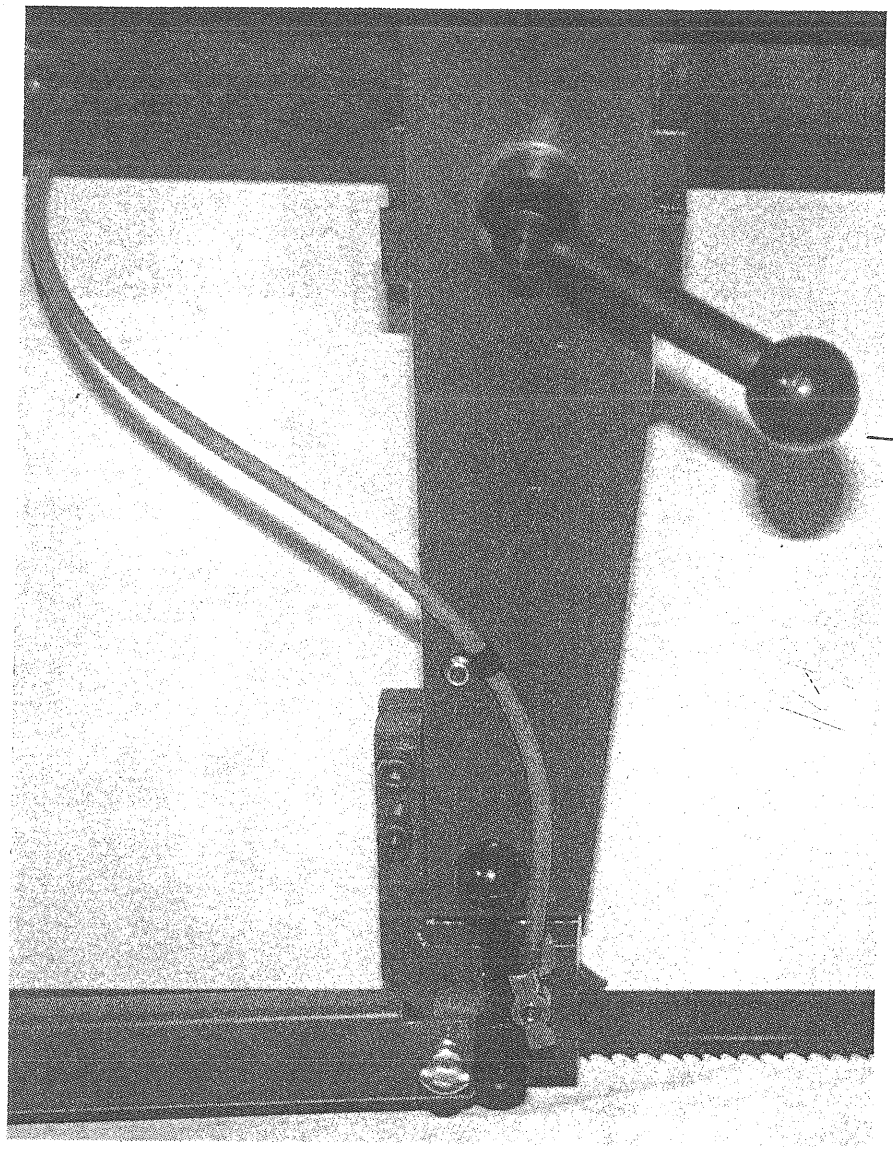


Fig 2C-5

GUIDE ARM POSITIONING

The adjustable guide arm should always be adjusted with respect to the material width. It will optimize cutting conditions and increase blade life. If properly adjusted, the guide arm should be as close to the material as permitted.

In order to adjust the guide arm, the locking lever should be released (turn counterclockwise), the guide arm moved and then locked in position.



NOTE: When making angle cuts it may be necessary to move the drive side guide arm also.

Guide Arm Locking Lever (shown locked)

Fig 2C-6

COOLANT FLOW

A generous flow of coolant should be applied in order to increase production and blade life.

The S-20 series bandsaw is provided with two independently controlled coolant spouts:

One spout is mounted on the adjustable idler side guide arm. This spout should always flood the blade with coolant. Slight readjustment may be required when changing the blade speed. A properly adjusted flow of coolant should cover the blade which in turn will carry it into the cutting area. Flow adjusting tap shown in Fig 2C-7.

The second spout is mounted on the drive side guide arm. The coolant hose should be used in cases of cutting solid bars, bundles or wide structurals. The flow of coolant should be directed into the opening in the material created by the blade. Flow tap shown in Fig 2C-7.

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

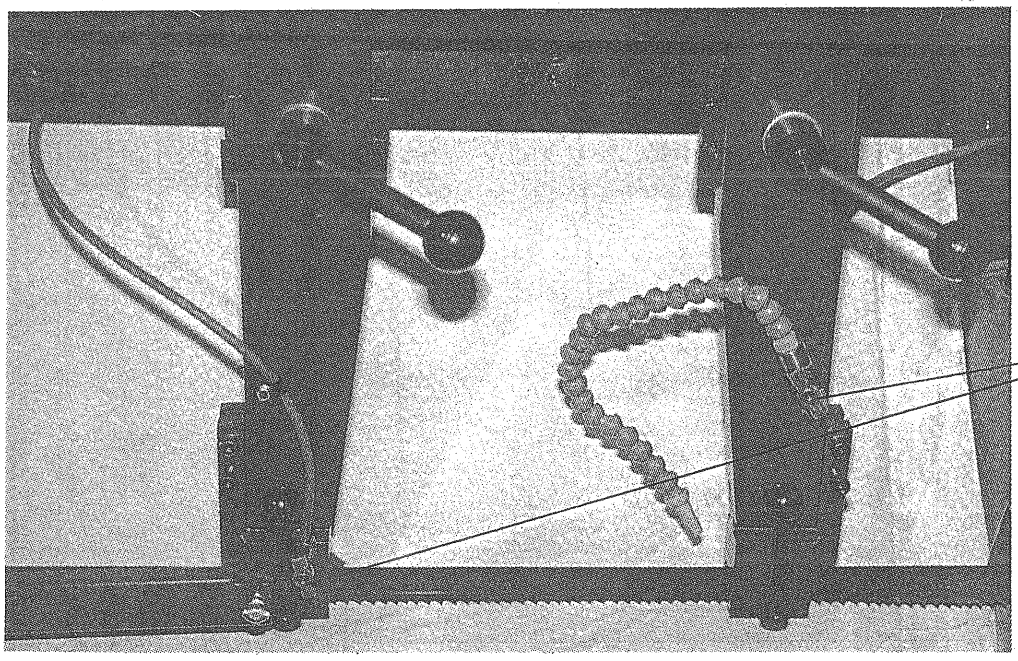


Fig 2C-7

SECTION 3 — MAINTENANCE AND TROUBLESHOOTING

BLADE CHANGING

1. Open idler and drive box doors.
2. Loosen blade tensioner which is located on the idler box side of the machine, Fig 3-1.
3. Turn the carbide tensioning levers counterclockwise on both guide arms, Fig 3-2.
4. Pull the blade off of the drive and idler wheels.
5. Push the blade down out from between the carbide guides.
6. Remove the blade.
7. Install a new blade.
8. Tighten the blade tensioner until the groove and the washer line up as shown in Fig 3-1
9. Turn the carbide tensioning levers clockwise until they rest on the stops.

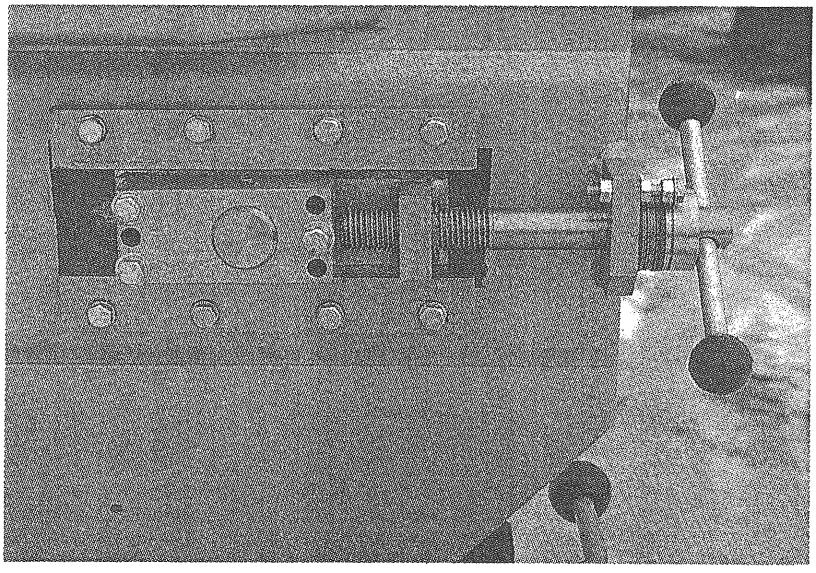


Fig 3-1 Blade Tensioning Device

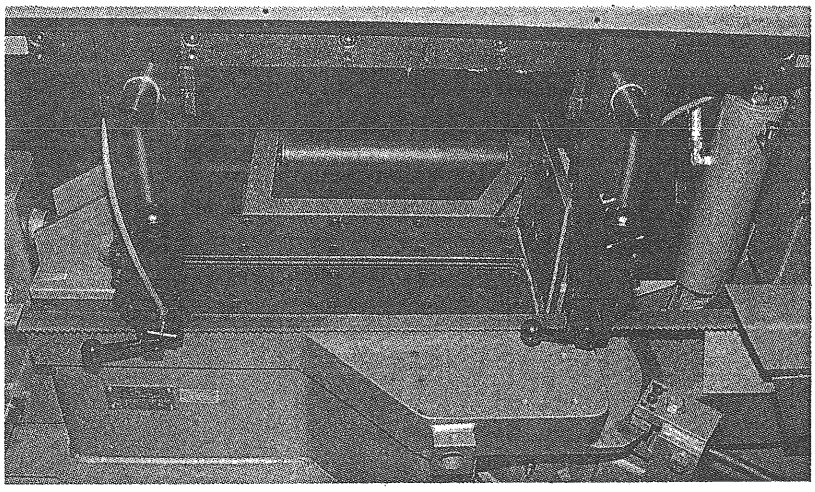


Fig 3-2 Guide Arms shown with carbides released for blade removal

BLADE BRUSH

The blade brush is properly set when machine leaves the factory but it wears out during operation and needs to be readjusted periodically. The blade brush assembly is shown in Fig 3-3. In order to readjust it the jam nut on the adjusting screw must be loosened and the screw turned counterclockwise until wires from the brush touch the bottom of the blade gullets as shown in Fig 3-4.
*NOTE: When a new blade brush has been installed adjustment is necessary to prevent premature wear.

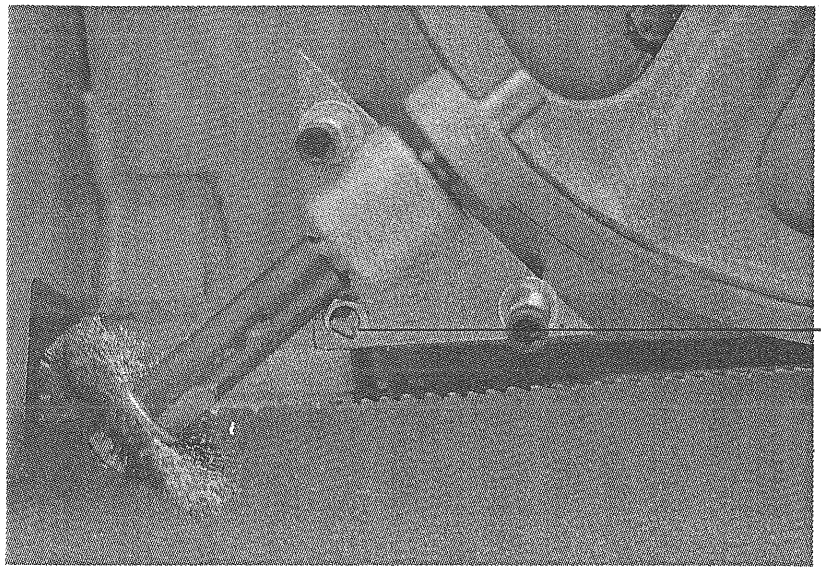


Fig 3-3 Blade Brush Assembly

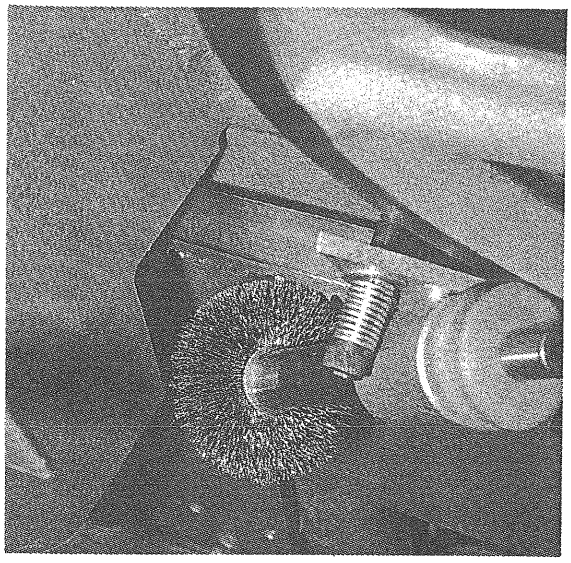


Fig 3-4 Properly Adjusted Blade Brush

If the brush gets worn to approximately 70% of its original diameter it should be replaced. A brush may be purchased through a HYD-MECH dealer in your area.

ANGLE BRAKE

The proper set-up for the angle brake is that the top jaw just touches the table top when the lock is released. The top jaw is adjusted by a push-pull arrangement of set screws and bolts. The bottom jaw controls the braking pressure.

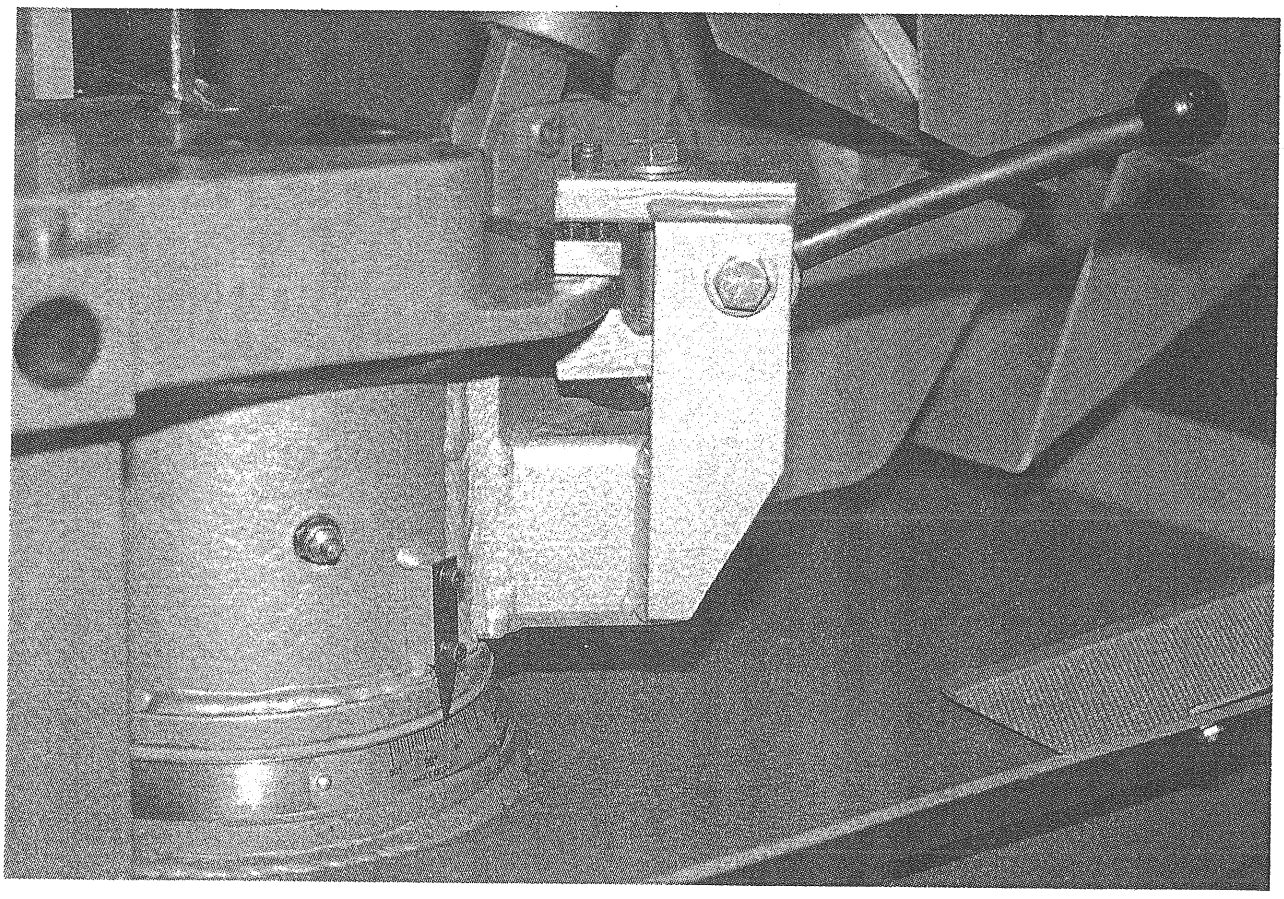
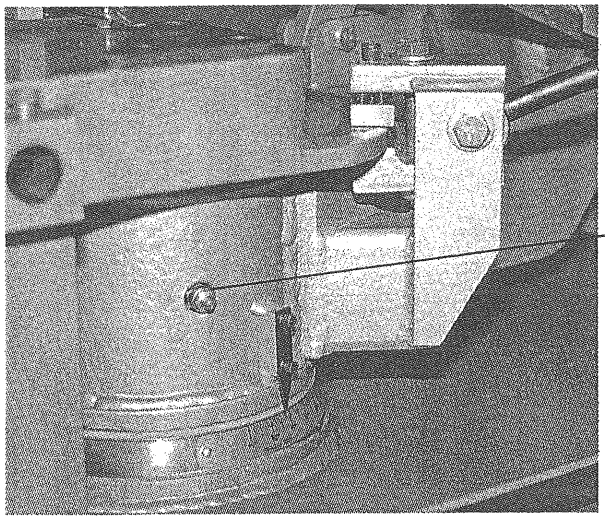


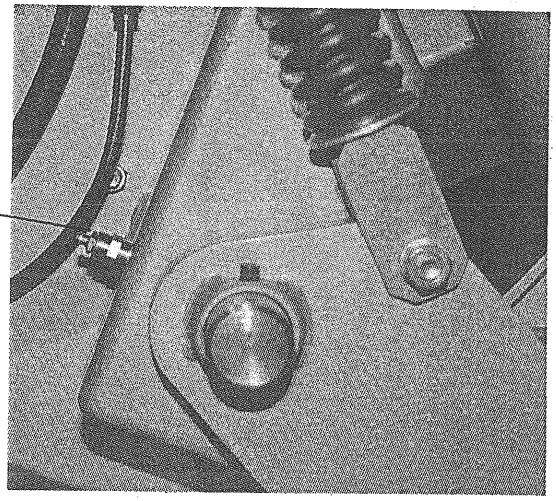
Fig 3-5

LUBRICATION

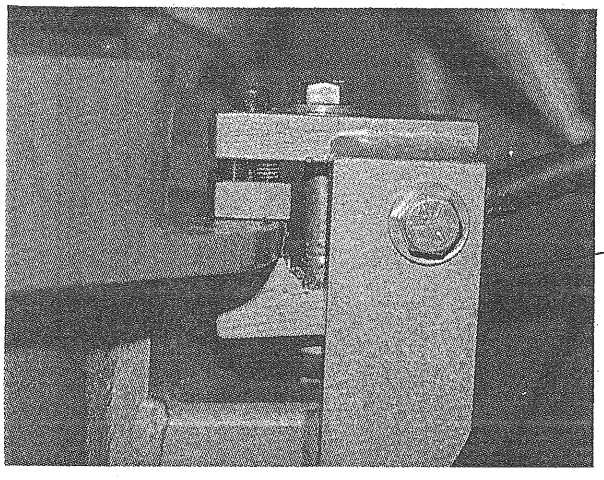
The lubrication design of the S-20 series saw was intended to minimize maintenance, although periodically certain moving parts need lubrication. We recommend that this lubrication be done using any general purpose grease, at the points indicated "G" in the following pictures.



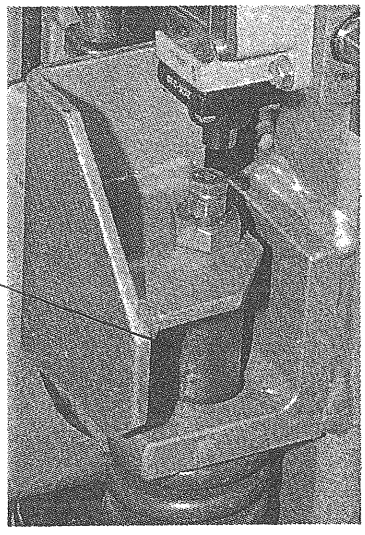
Vertical Pivot



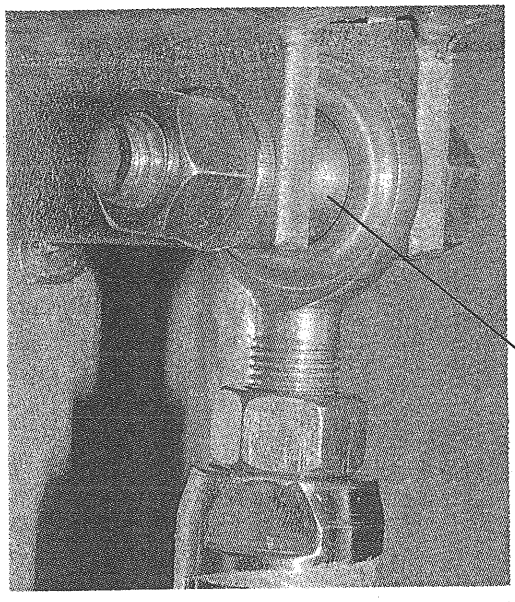
Horizontal Pivot



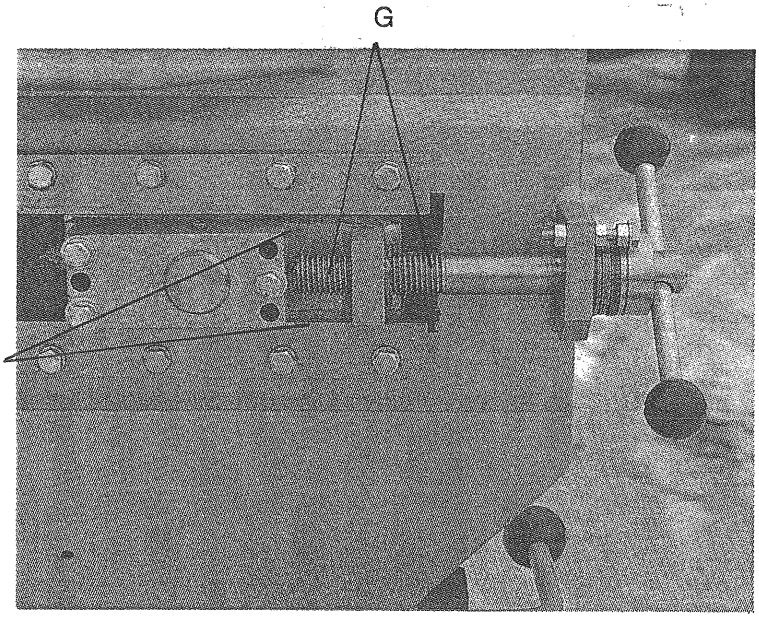
Angle Brake Cam



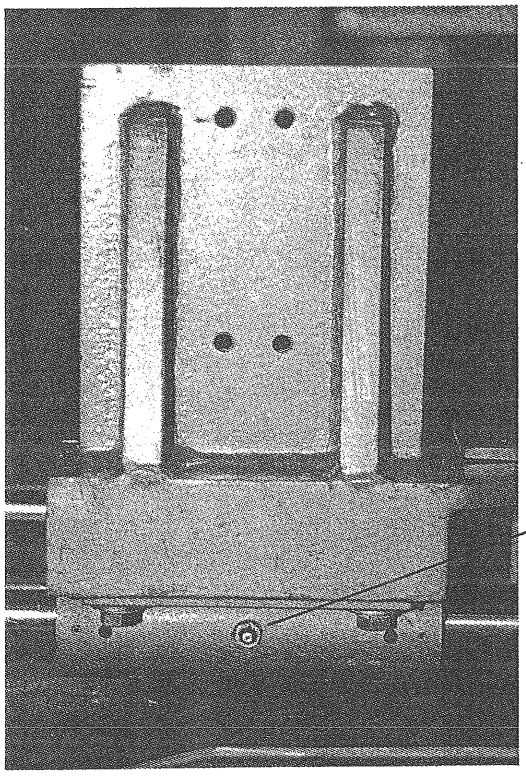
Counter Balance Spring Rod



Cylinder Eye



Idler Wheel Ways



Shuttle Bearing Housing

Note: Grease fittings on both shuttle bearing housings.

CLEANLINESS

The S-20 series design should endure heavy operating conditions and provide the customer with flawless machine performance. To extend good performance some care is required, especially cleanliness.

The following areas should be kept clean of dirt, grease and chips:

- CONTROL CONSOLE
- DOOR CHARTS
- WHEEL BOXES
- BLADE GUIDES
- OUTFEED TABLE
- LARGE BUILD UP OF CHIPS IN THE SAW BASE
- VISE TRAVEL

NOTE: All parts should be cleaned before any repair or service is performed on them.

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 every 2000 working hours or once per year. Suitable replacement elements are:
   CANFLO RSE - 30 - 10
   GRESEN K - 23018
   LHA SPE - 15 - 10
   ZINGA AE - 10

2. OIL LEVEL - Oil level should be maintained in the upper half of the level gauge. Normally the rate of oil consumption will be very low and it should be unnecessary to add oil more often than at filter changes. Add oil only to the top line on level gauge.

   The S-20 series saws are shipped from the factory with Shell Tellus 46 hydraulic oil. Generally any brand of recognized *mineral* hydraulic oil with the same properties should be compatible with Tellus 46, but to avoid any risk we suggest staying with Tellus 46. If it is desired to change brands, it is necessary to drain the tank and 1/3 refill it with the new oil, operate through several automatic cycles with the vise set to full stroke and head to full rise, drain the tank again, and finally fill the tank with the new brand.

   The hydraulic tank capacity is approximately 10 U.S. gallons.

   Recommended replacement oils: Chevron - Chevron AW Hydraulic Oil 46
   Esso - NUTO H46
   Mobil - Mobil DEC 25
   Petro Canada - Harmony AW 46
   Texaco - Rando HD 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 above room temperature. Thus in a 70° F shop one might expect an oil temperature of about 120° F. Oil temperature should never exceed 160° F.

4. OIL PRESSURE - Oil pressure is factory set to 475 PSI ± 25 PSI and should not require further attention except precautionary observation at start-up and every few days thereafter.

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. He has trained field service persons 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. Carbide guides loose.	1b. Tighten.
2. Saw is cutting out of square horizontally.	2a. Angle not set correctly.	2a. Adjust accordingly.
	2b. Angle pointer loose.	2b. Adjust and tighten.
	2c. Stock not square in vise.	2c. Adjust accordingly.
3. Blade comes off wheel.	3a. Not enough blade tension.	3a. Tension blade.
	3b. Improper tracking.	3b. Adjust accordingly.
4. Blade stalls in cut.	4a. Not enough blade tension.	4a. Tension Blade.
	4b. Excessive feed rate.	4b. Reduce.
5. Blade vibrating 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.
NOTE: new blades tend to vibrate until they are "broken in".		
6. Excessive blade breakage.	6a. Excessive blade tension.	6a. Reduce.
	6b. Excessive feed rate.	6b. Reduce.
7. No coolant flow.	7a. No coolant.	7a. Add coolant.
	7b. Coolant line blockage.	7b. Blow out coolant lines.
	7c. Coolant pump inoperable.	7c. Check and replace if necessary.
8. Saw will not start.	8a. Piece Counter set at "0".	8a. Reset Piece Counter.
	8a. Motor overload has tripped.	8a. Depress each of the reset buttons on the top of the main control box; depressing one reset at a time and trying to start the saw will indicate which motor was overloaded.
	8c. Control circuit fuse has blown.	8c. Replace the fuse with a 5 Amp 250 volt AG1 type fuse. Random blowouts may occur but a quickly repeated blowout indicates an internal wiring fault.
9. Saw starts but no hydraulic functions.	9a. If blade wheels run clockwise, wrong phase order in power connection to saw.	9a. Stop immediately; reverse any two of the three line phase connections.
	9b. If pump is noisy, low hydraulic oil.	9b. Stop immediately, add hydraulic oil.

In Manual Mode

PROBLEM	PROBABLE CAUSE	SOLUTION
10. Head will not rise.	10. Head up limit switch is set fully down.	10. Readjust head up limit switch knob upwards.
11. Head will not descend.	11a. Feed Rate Valve is fully closed-pointer is set on "0" or close to "0" in/min.	11a. Turn Feed Rate Knob counterclockwise to open valve.
	11b. Feed Force Limit is set too low.	11b. Increase Feed Force Limit (to at least .100 PSI).
	11c. Pointer is adjusted wrong.	Loosen pointer; turn knob clockwise until it bottoms; tighten pointer at "0".
12. Head descends even when Feed Rate Valve is fully closed - pointer is set on 0 in/min and Feed Force Limit gauge reading is "0" PSI.	12. Relief Valve is not sealing properly. Dirt on Ball seat is most likely the cause.	12. Lower head. Remove front side panel of infeed to gain access to relief valve which is mounted in a stack on the main manifold below the pilot operated check. Unscrew relief valve adjusting bolt and remove spring and ball. Clean up seat by gentle use of compressed air or merely by letting oil trickle out. Reassemble and adjust relief valve so that head will not descend when Feed Force Limit is set at 40 PSI.
13. Head descends when Feed Rate Valve pointer is set to "0" on the scale and Feed Force Limit gauge is more than 100 PSI.	13a. Pointer of Feed Rate Valve is stopped by stop bolt but not fully closing the valve.	13a. Readjust pointer. As in 11 c.
	13b. Fast Approach Valve is open by blocked lever.	13b. Readjust Fast Approach Lever.
14. Head still will not rise or fall, or any individual function will not 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 - check operation of related limit switches. Limit switch levers should operate freely and emit an audible click on both depress and release. If not replace the switch nose. Look for cause of switch damage (ie debris or maladjustment of switch actuator). To check the switch unit itself, remove the switch lid and wire together the two terminals

PROBLEM	PROBABLE CAUSE	SOLUTION
		closest to the wiring port. If function now responds to manual switch replace internal limit switch unit. If function still does not respond then . . . Remove front side panel to gain access to valves. 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.
	14b. If pilot light related to inoperative function does light, problem may still be the coil (see 14a solution). If problem remains it probably results from dirt in the valve spool.	14b. Disassembly of hydraulic valves should be undertaken only by qualified service personel or those knowledgeable with hydraulic components.
15. Auto cycle stops.	15a. If cycle seems to stop because a particular function is inactive, switch to manual and see if that function is still inactive. If so see previous section "IN MANUAL MODE". Begin auto cycle over again from start position on Auto Cycle Dial; note last function motion before the cycle stops and check related limit switch function. For example, if the head comes down and then the cycle stops, check that the head down limit switch is being actuated by proding it with a screwdriver. If the auto cycle resumes, the limit switch actuating bolt must be readjusted. Similarly if the shuttle advances and then the cycle stops, check that the shuttle forward limit switch is being actuated.	15a. Readjust limit switch actuator.

PROBLEM	PROBABLE CAUSE	SOLUTION
	15b. If the cycle does not respond to limit switch proding, check for a damaged limit switch as outlined in 14a SOLUTION, above. In this case wire together the two switch terminals furthest from the wiring port.	15b. Check for cause of damage and replace limit switch components as needed.

SECTION 4 — ELECTRICAL SYSTEM

GENERAL INFORMATION

The power connection to the machine is made to the L1, L2, and L3 terminals of the contactor located in the main control box. As supplied, the machine is set to run on three phase voltage as indicated on the serial plate and voltage label.

In order to use the machine on a different supply voltage the following changes must be made:

1. Change the blade motor (or if equipped with a dual voltage motor, rewire it).
2. Change the hydraulic pump motor (or if equipped with dual voltage motor, rewire it).
3. Change the control transformer (or if equipped with a dual voltage unit, rewire it).
4. Change the blade and pump motor overloads, located adjacent to the contactor, to suit the full load current of the new or rewired motor.

All other components are supplied from the control transformer and operate on 115V, single phase. They do not need altering.

The machine is supplied for use on a 60HZ supply. For use on 50HZ supply consult the factory.

WHEN CHANGING SUPPLY VOLTAGE, CAREFULLY OBSERVE THE ABOVE STEPS. THESE STEPS ARE ESSENTIAL TO AVOID SEVERE DAMAGE TO THE MOTORS AND CONTROLS.

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.

STANDARD CAM PROGRAMMER ELECTRICAL COMPONENTS

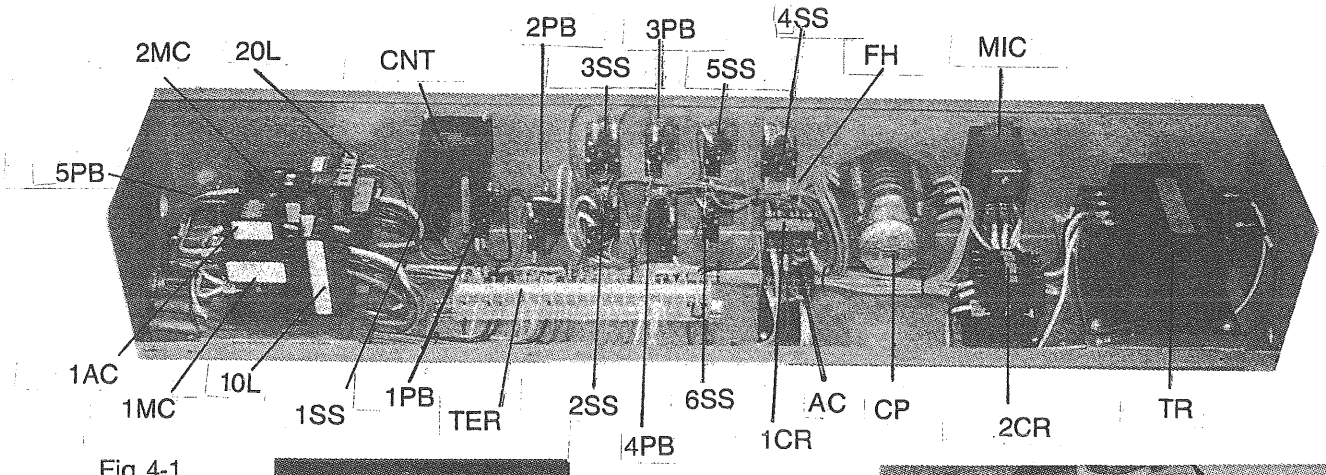
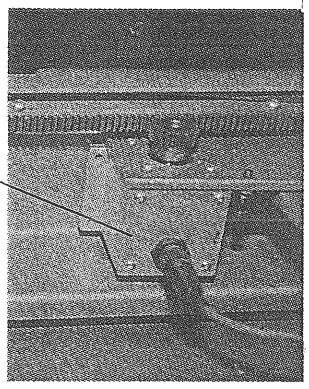


Fig 4-1



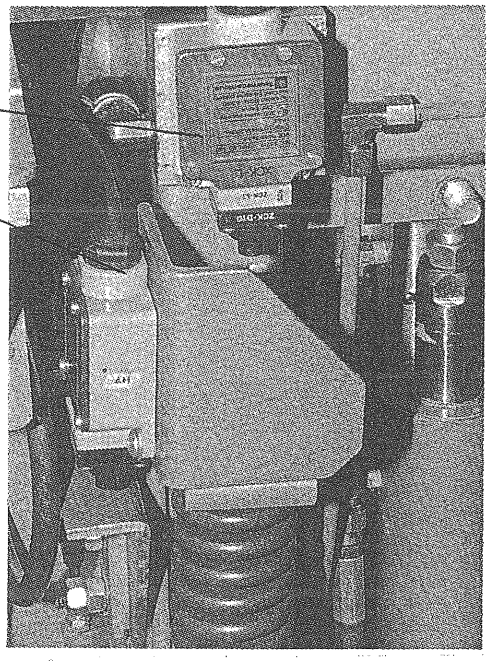


Fig 4-3 Head Up Limit Switch (1LS)
Head Down Limit Switch (2LS)

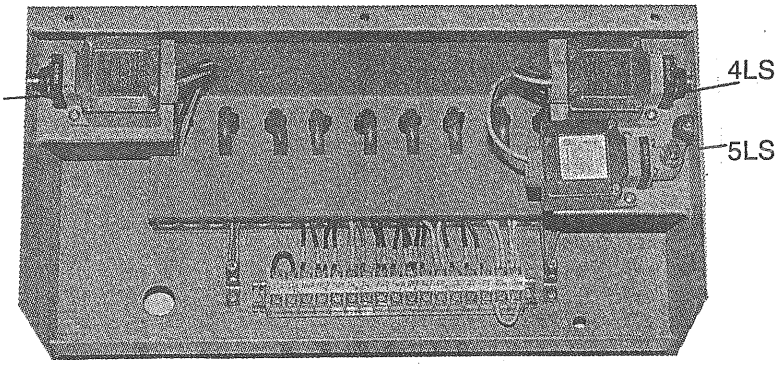


Fig 4-2 Lower Electrical Box

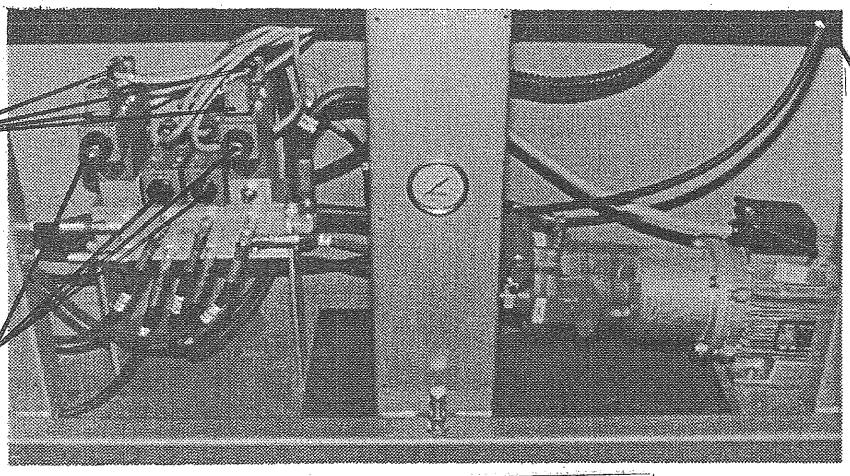


Fig 4-4 Hydraulic Pump and Manifold Assembly

PLC OPTION

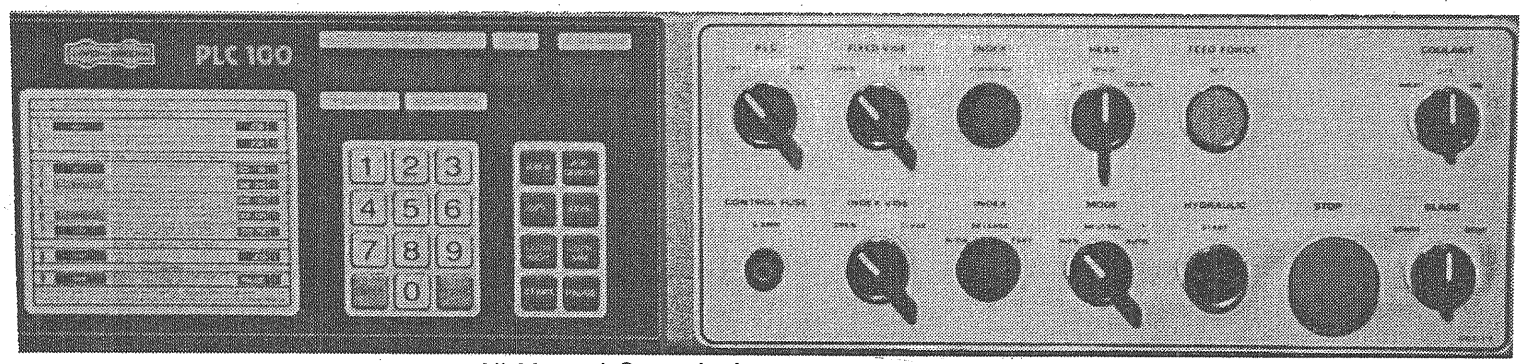


Fig 4-5

All Manual Controls Are
The Same As On An S-20A
Machine Not Equipped With The
PLC Option

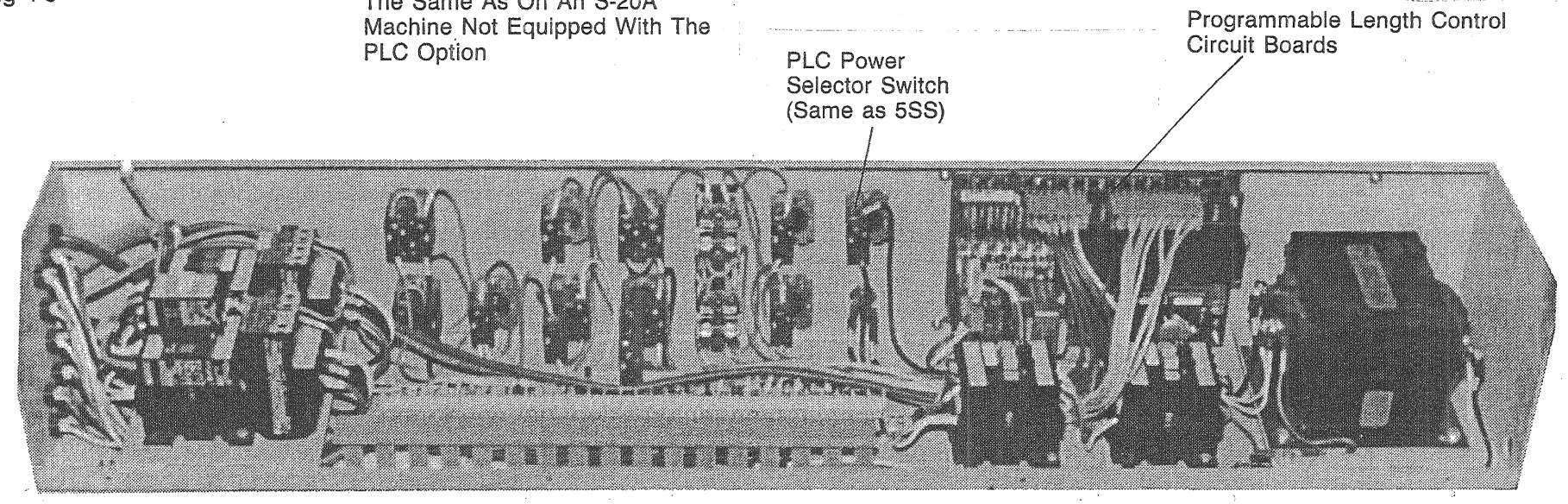


Fig 4-6

LIST OF S-20A ELECTRICAL COMPONENTS

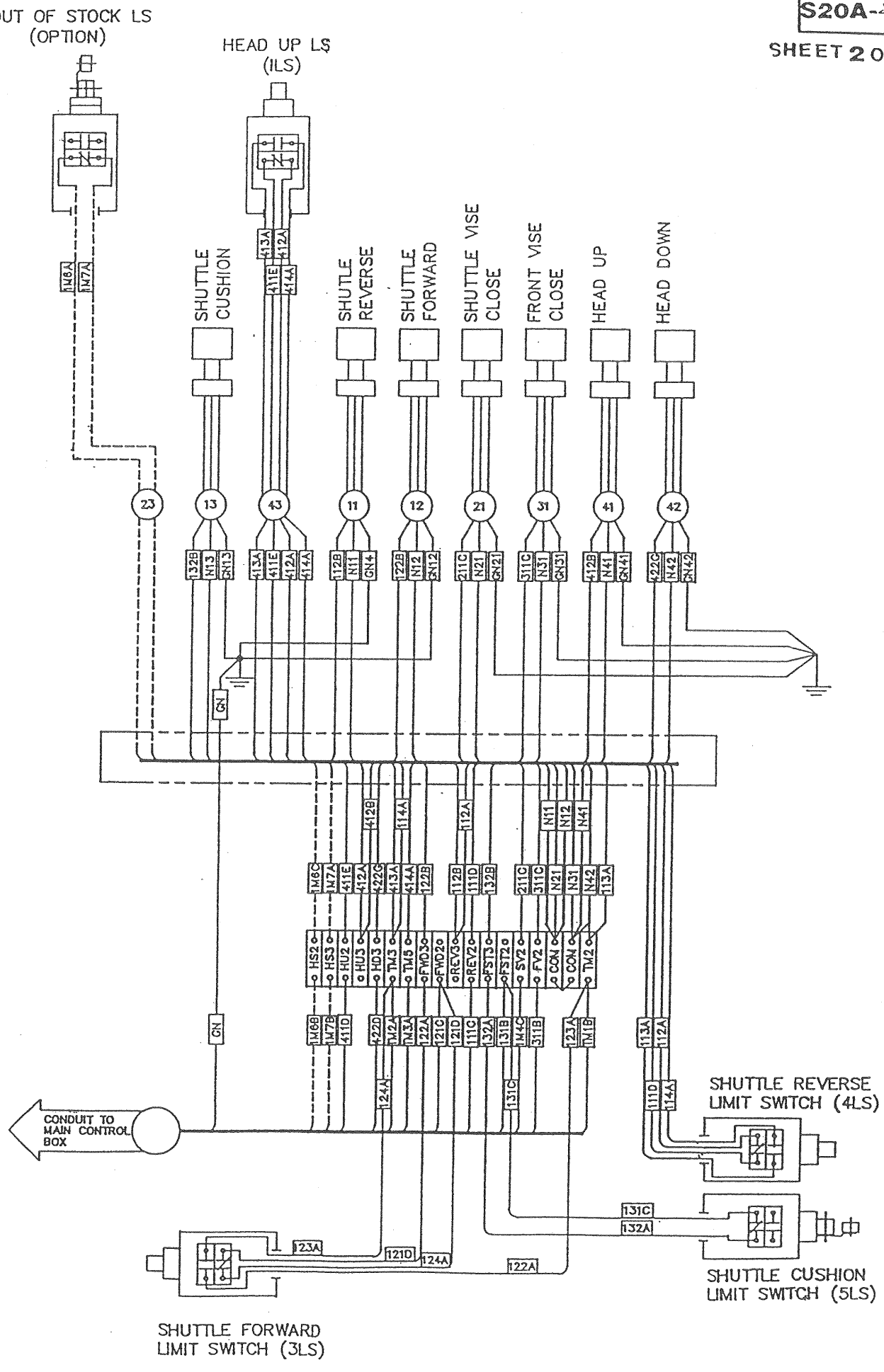
Item Code as on S-20A Sch.	Function	Description	Component Manufacturer	Component Number
1PB	Stop push button	Operating Head (red mushroom)	Telemecanique	ZB2-BA3
		1 (NC) contact block	Telemecanique	ZB2-BA3
2PB	Hydraulic Start push button	Operating Head (green illuminated) (flush style)	Telemecanique	ZB2-BW33
		Lamp Block	Telemecanique	Z..-BW06
		130V Lamp	Telemecanique	B3013
		1 (NO) contact block	Telemecanique	ZB2-BE102
3PB	Index Forward push button	Booted Push button Operator	Telemecanique	XAC-B9212
		2 contact block assembly, 1 (NO), 1 (NO) early close	Telemecanique	XEN-B1181
4PB	Index Reverse push button	Booted Push Button Operator	Telemecanique	XAC-B9212
		2 contact block assembly, 1 (NO), 1 (NO) early close	Telemecanique	XEN-B1181
5PB	Feed Force Limit Setting push button	Operating Head (yellow flush style)	Telemecanique	ZB2-BA5
		1 (NO) contact	Telemecanique	ZB2-BE101
1SS	Blade Start/Stop selector switch	Operating Head (3 position with spring return to centre)	Telemecanique	ZB2-BD5
		Start-1 (NO) contact	Telemecanique	ZB2-BE101
		Stop-1 (NC) contact	Telemecanique	ZB2-BE102
2SS	Mode Man/Neu/Auto selector switch	Operating Head (3 position maintained, long)	Telemecanique	ZB2-BJ2
		3 (NO) contacts	Telemecanique	ZB2-BE101
3SS	Head Up/Hold/Down selector switch	Operating Head (3 position maintained, long)	Telemecanique	ZB2-BD5
		2 (NO) contacts	Telemecanique	ZB2-BE101
4SS	Coolant selector switch	Operating Head (3 position, maintained)	Telemecanique	ZB2-BD3
		2 (NO) contacts	Telemecanique	ZB2-BE101
5SS	Fixed Vise selector switch	Operating Head (2 position maintained, long)	Telemecanique	ZB2-BJ2
		1 (NO) contact	Telemecanique	ZB2-BE101
6SS	Index Vise selector switch	Operating Head (2 position maintained, long)	Telemecanique	ZB2-BJ2
		1 (NO) contact	Telemecanique	ZB2-BE101

FU	Fuse Holder Fuse	Standard for 1"x1/4" 5A 250V Slo-Blo	Little Fuse BUSS	H342-858 MDL-5
CP	Cam Programmer	Cycle Control	SAIA	KKB50-4S-10
TR	Transformer	Open Style 500VA 60Hz single phase Prim. V. - Sec. V.		
		240V-120V	Hammond	HT97838
		480V-120V	Hammond	HT97818
		600V-120V	Hammond	HT96808
1MC	Motor Contactor	Open Style	Telemecanique	LC1-D1210G6
2MC	Motor Contactor (blade)	Open Style	Telemecanique	LC1-D1210G6
1AC	Auxiliary Contact Block	2 contacts 2(NO)	Telemecanique	LA1-DN20
20L	Motor Overload (blade)	Triple Pole Thermal		
		3HP 208/240V	Telemecanique	LR2-D1314
		3HP 480V	Telemecanique	LR2-D1310
		3HP 600V	Telemecanique	LR2-D1308
	(optional 5HP)	5HP 208-240V	Telemecanique	LR2-D1308
		5HP 480V	Telemecanique	LR2-D1314
		5HP 600V	Telemecanique	LR2-D1310
10L	Motor Overload (hydraulic)	Triple Pole Thermal		
		2HP 208/240V	Telemecanique	LR2-D1312
		2HP 480V	Telemecanique	LR2-D1308
		2HP 600V	Telemecanique	LR2-D1307
1LS	Head Up limit switch	Rod Plunger	Telemecanique	XCK-L110H7
2LS	Head Down limit switch	Rod Plunger	Telemecanique	XCK-L110H7
3LS	Index Forward limit switch	Rod Plunger	Telemecanique	XCK-L110H7
4LS	Index Back limit switch	Rod Plunger	Telemecanique	XCK-L110H7
5LS	Index Cushion limit switch	Roller Arm	Telemecanique	XCK-L115H7

	Solenoid		Parker Hagglunds	697228 11-236R
	Hirschman Connectors	Female Connector with light indicator GDM 2011	GDM	927811-011
	El. Motor (blade)	182TC/3PH/3HP 208/240V 480V 600V		
	El. Motor (5HP option) (blade)	184TC/3PH/5HP 208/240V 480V 600V		
	Multi-Index		Eagle	DZ101A3
	Piece Counter		Durant	3-Y-11564-115-A
	Reset Button	General Electric	CR4XY27	
	El. Motor (hydraulic)	145TC/3PH/2HP 208/240V 480V 600V		
PLC (Optional)	Length Controller	Programmable Logic Control	HYD-MECH	
	Encoder	Incremental Shaft encoder	Deem Controls Inc.	MSE-3121-1000-QF

PART # S20A-7-2A

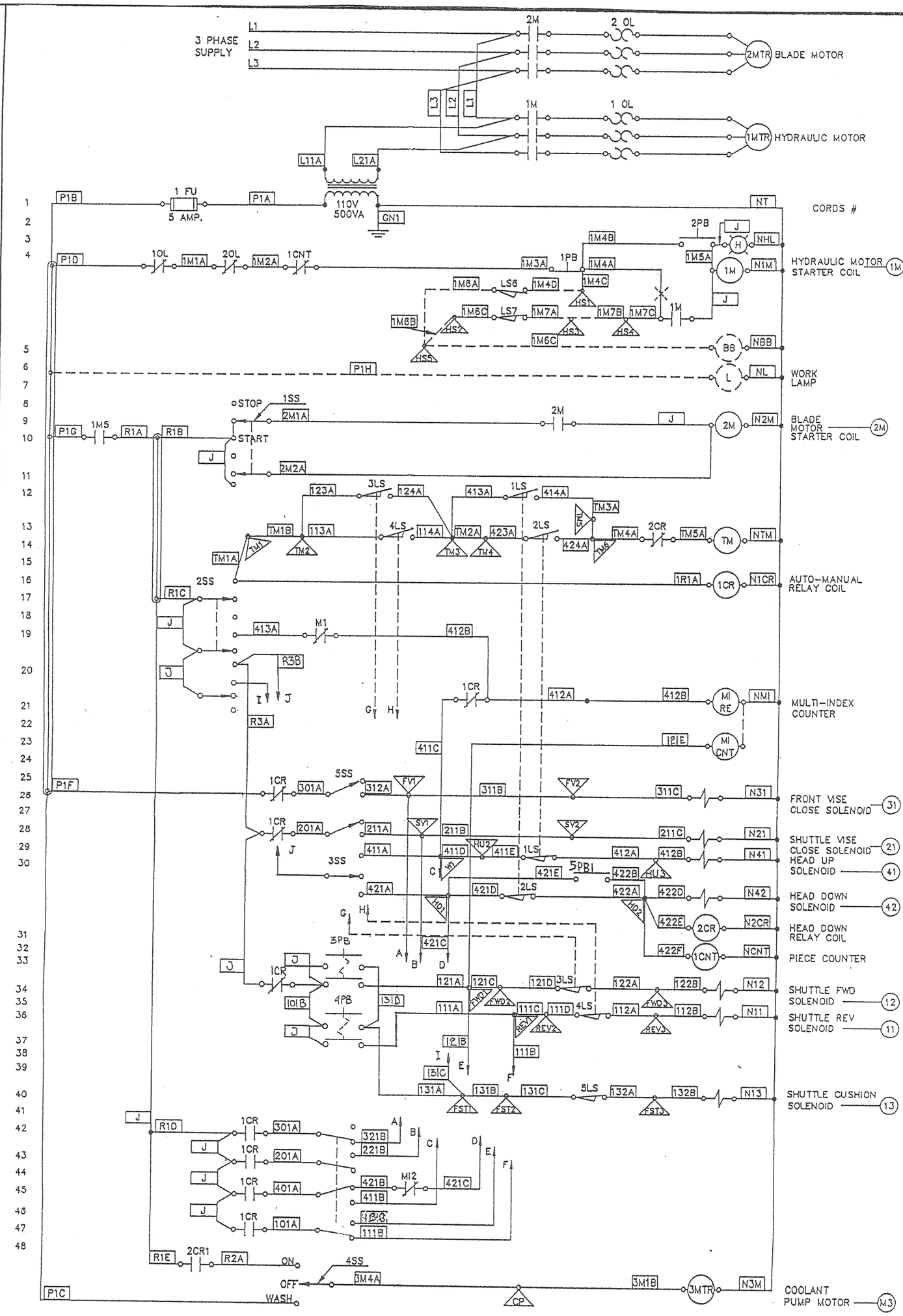
SHEET 2 OF 5



HYD-MECH ENGINEERING LTD.
239 BEARDS LANE
WOODSTOCK, ONTARIO

date: DEC-91 scale: ____ dwn: SCS

description: **ELECTRIC WIRING DIAGRAM**



LEGEND

- NORMALLY CLOSED PUSH BUTTON
- NORMALLY OPEN PUSH BUTTON
- 3 POSITION PUSH BUTTON
- NORMALLY OPEN RELAY CONTACT
- NORMALLY CLOSED RELAY CONTACT
- WIRES MTG AND CONTACT POINT AT TERMINAL BLOCK
- SELECTOR SWITCH
- NORMALLY OPEN LIMIT SWITCH
- NORMALLY CLOSED LIMIT SWITCH
- NORMALLY OPEN LIMIT SWITCH HELD CLOSED
- NORMALLY CLOSED LIMIT SWITCH HELD OPEN
- OVERLOAD RELAY
- PILOT LIGHT
- COMMON TERMINAL

WIRE NUMBERING CODE:

3M1A — WIRE #

COMMON LINES — RELATED DEVICE , T, 1M, 32

CONTROL LINES — WIRE # A,B,C; CONDUCTOR # 1,2,3; FUNCTION OR RELATED DEVICE , P, R, 32

- CONNECTIONS FOR OPTIONS ONLY
- STANDARD CONNECTIONS REMOVED WHEN OPTION APPLIED

TOLERANCES UNLESS OTHERWISE SPECIFIED
2 PLC DEC
3 PLC DEC
FRACTIONAL
ANGULAR

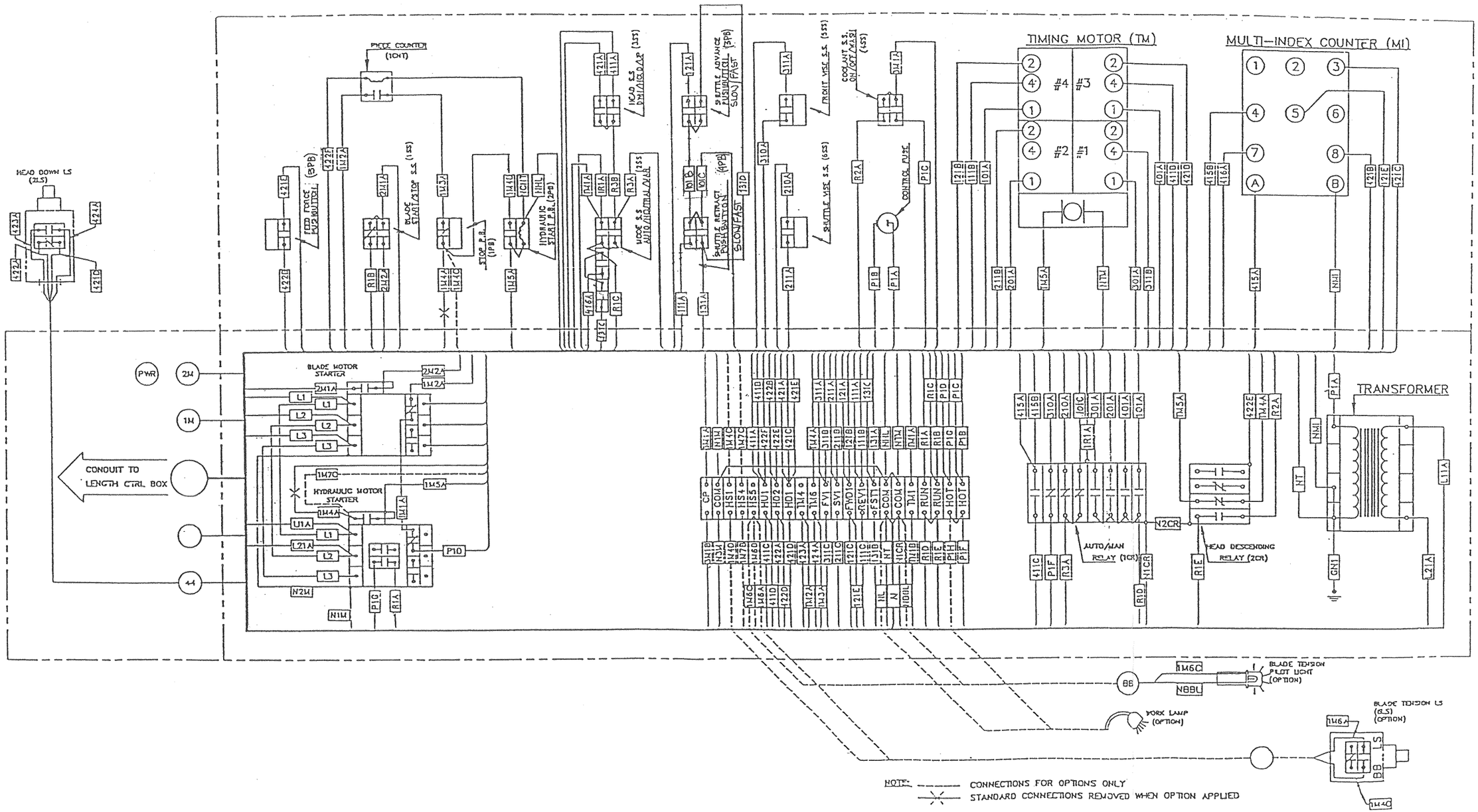
DWN. SCS
SCALE —
DATE JUNE '92

HYD-MECH ENGINEERING LTD.
WOODSTOCK, ONTARIO

TITLE
ELECTRIC SCHEMATIC

DWG. NO.
S20A-7-00-1A

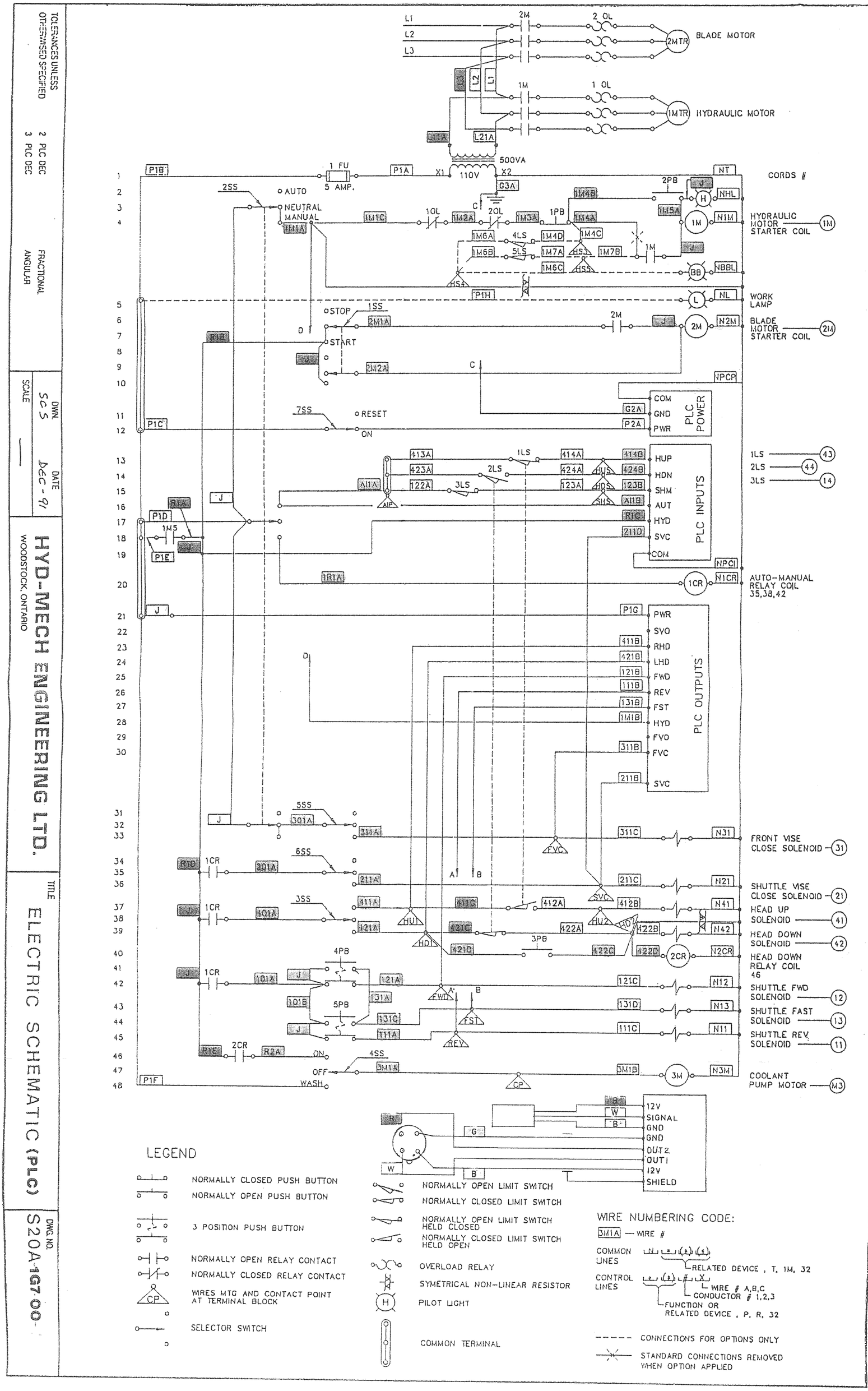
PAGE 1 OF 3



TOLERANCES UNLESS OTHERWISED SPECIFIED	2 PLC DEC	FRACTIONAL	DWN. SCS	DATE JUNE '92	HYD-MECH ENGINEERING LTD.
	3 PLC DEC	ANGULAR	SCALE		WOODSTOCK, ONTARIO

TITLE: ELECTRIC WIRING DIAGRAM

DWG. NO. S20A-7-00-2A



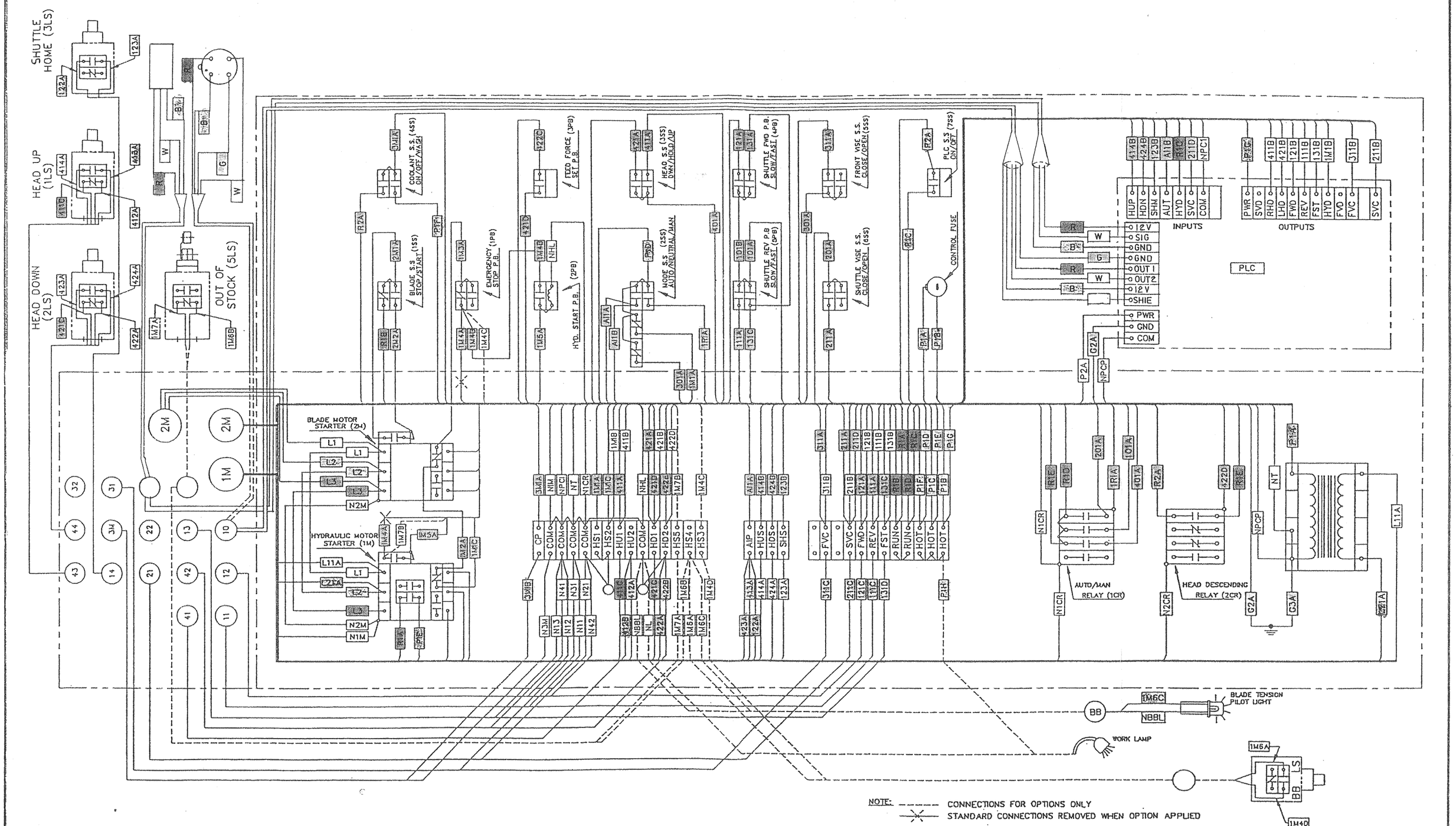
TOLERANCES UNLESS OTHERWISED SPECIFIED
2 PLC DEC
3 PLC DEC
FRACTIONAL
ANGULAR

DWN. SCS
DATE Dec-91
SCALE —

HYD-MECH ENGINEERING LTD.
WOODSTOCK, ONTARIO

TITLE
ELECTRIC SCHEMATIC (PLC)

DWG. NO.
S20A-1G7-00-



TOLERANCES UNLESS OTHERWISED SPECIFIED 2 PLC DEC FRACTIONAL 3 PLC DEC ANGULAR	DWN. SCS DATE Dec-91 SCALE —	HYD-MECH ENGINEERING LTD. WOODSTOCK, ONTARIO	TITLE ELECTRIC WIRING DIAGRAM (PLC)	DWG. NO. S20A-1G7-00-1

SECTION 5 — HYDRAULIC SYSTEM

The S-20A hydraulic system does not require any special work on a new machine before its start-up. The hydraulic tank is filled with Shell Tellus 46 hydraulic oil and all machine functions have been tested at the factory to ensure proper operation upon initial start-up.

PARTS LIST AND PHOTOS OF HYDRAULIC COMPONENTS

ITEM	QTY.	DESCRIPTION OF PARTS	PART NUMBER
1	1	Head Cylinder	A20-63C-00
2	2	Vise Cylinder	A20-65-00
3	1	Shuttle Cylinder	A20-64-00
4	1	Positive Down Feed Valve	DF1-0-00
5	2	Directional Control Valve	DCV3P-AB-T
6	2	Directional Control Valve	DCV2P-AB-PT
7	1	Relief Valve	RV-11-00
8	1	Manifold Block	MB4P
9	1	Shuttle Cushion Valve	A20-6-01
10	2	Double Pilot Check	DPCH-1
11	1	Pressure Gauge (1000 PSI)	PG-10
12	1	Pressure Gauge (500 PSI)	PG-5
13	1	Pump	HYP-1
14	1	Suction Strainer	SS-100-00
15	1	Return Filter	AE-10
16	1	Vise Pressure Reducing Valve (Option)	PRV2-00

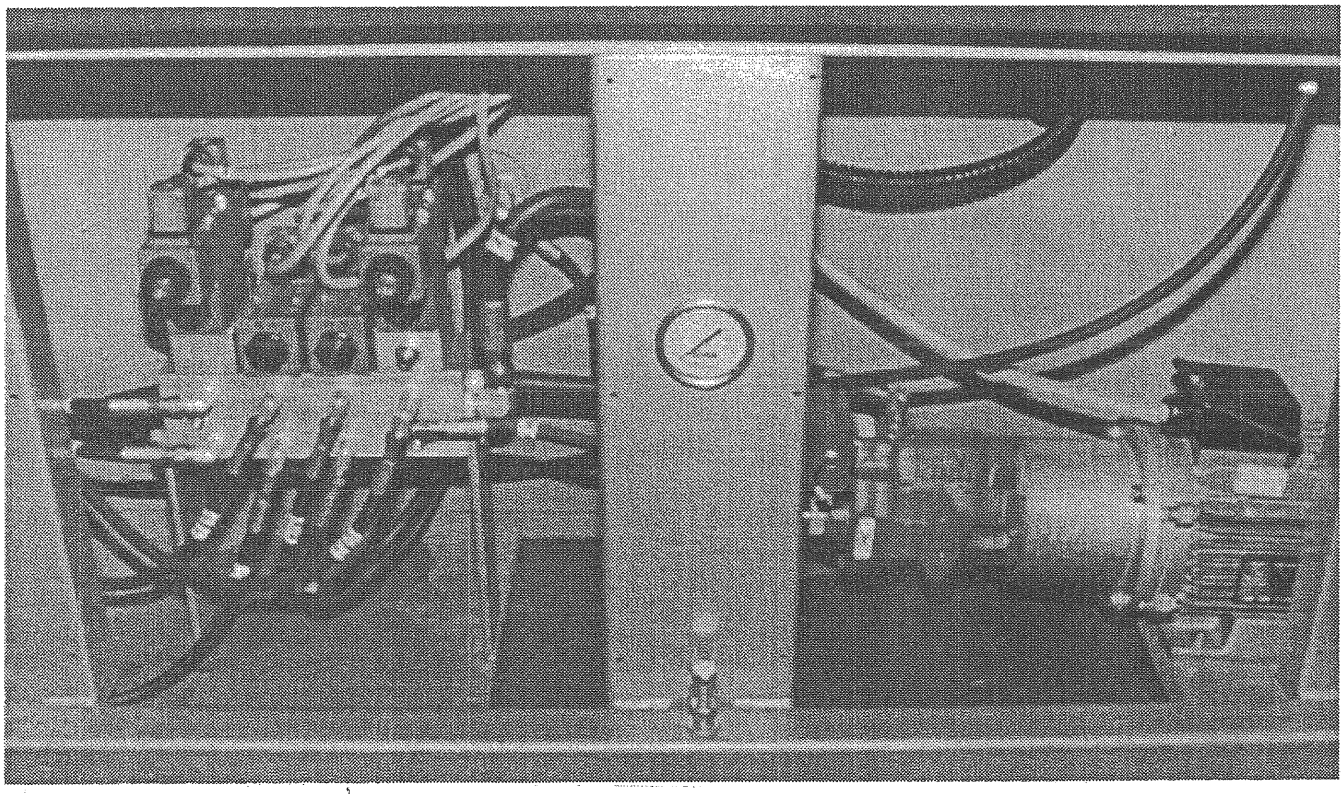


Fig. 5.1 Hydraulic Pump and Manifold Assembly

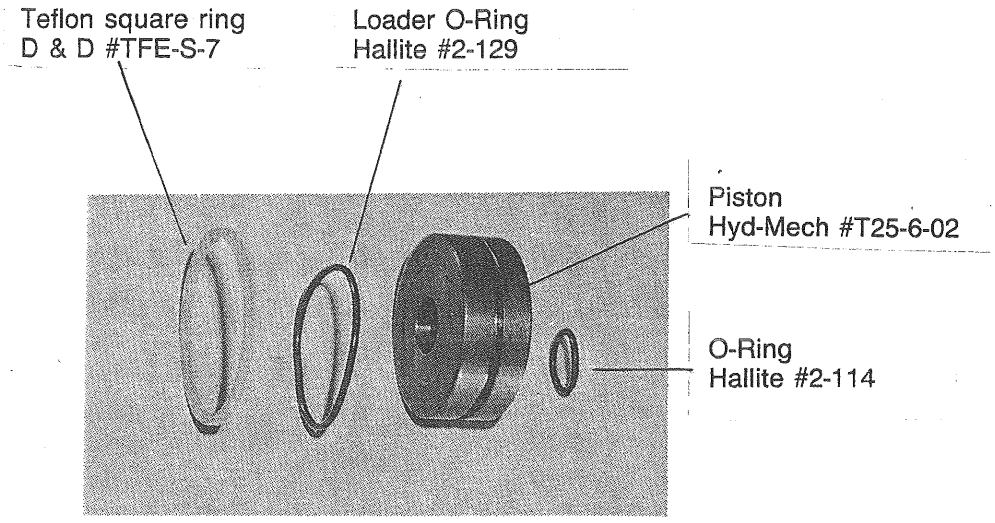


Fig 5-2 Piston and seals for 2" diameter bore cylinder.

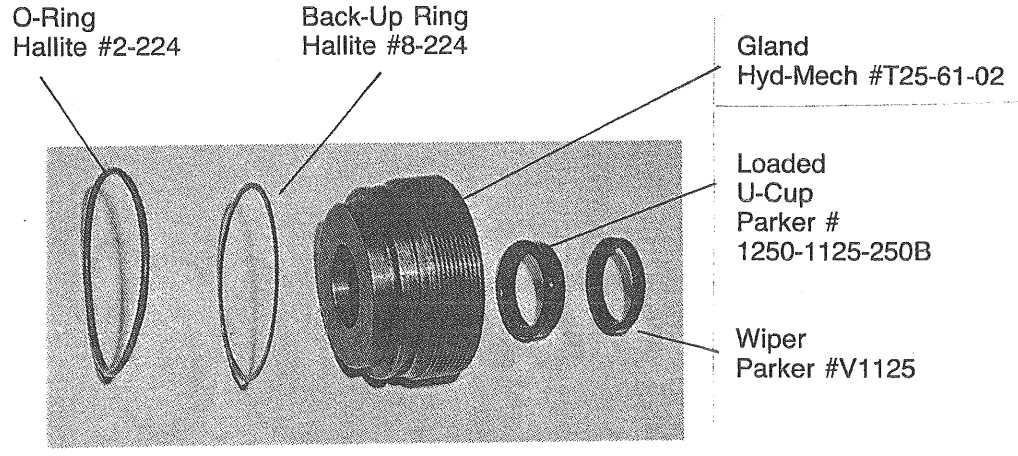
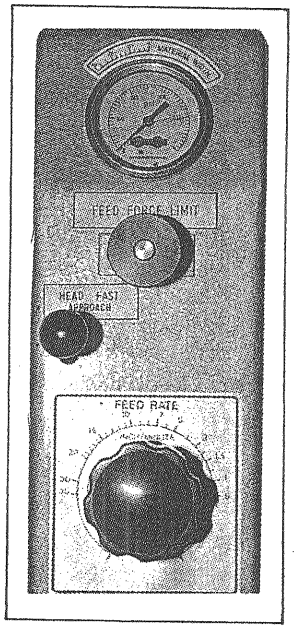
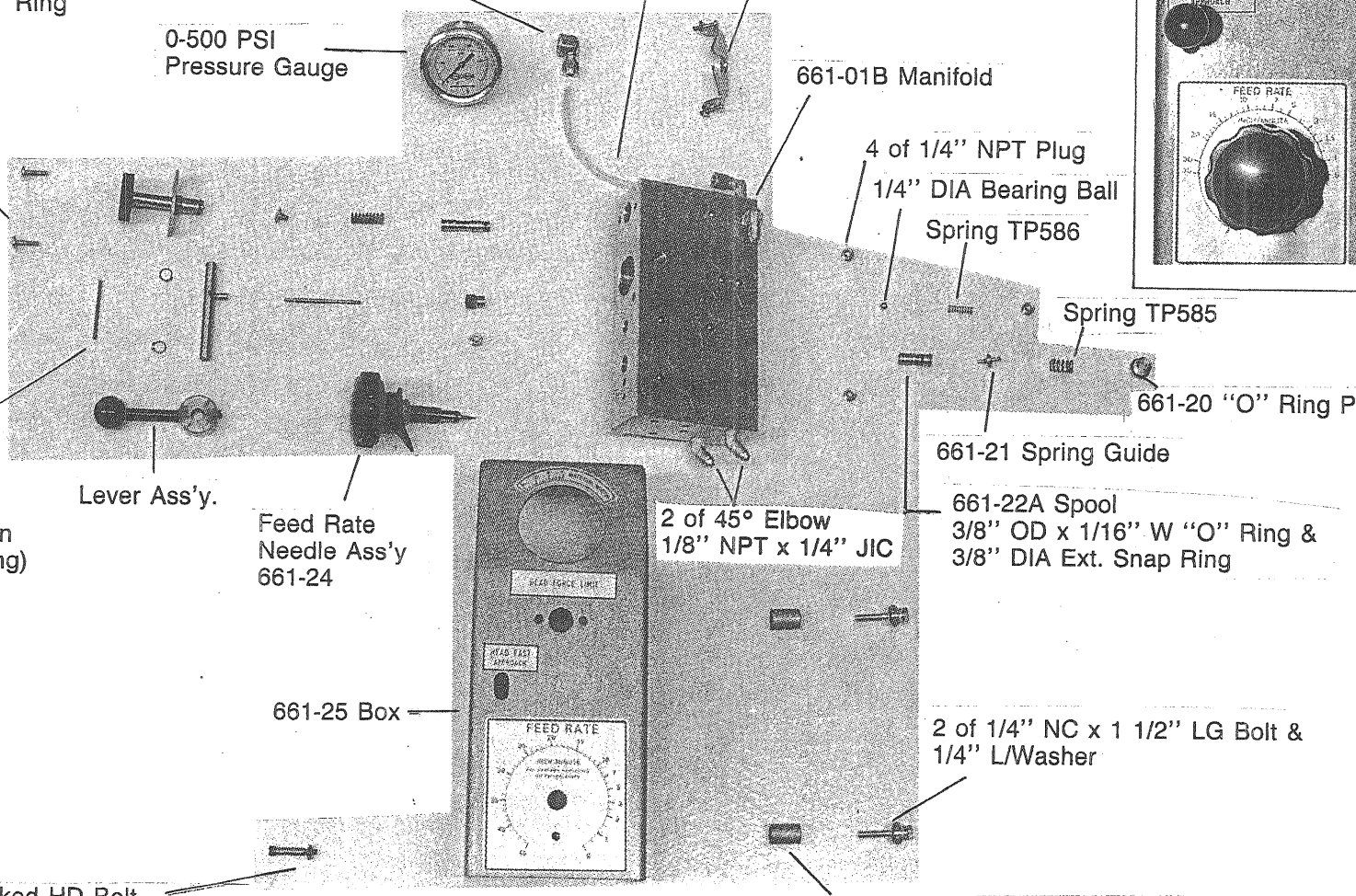


Fig 5-3 Gland and seals for 2" diameter bore cylinder.

POSITIVE DOWNFEED VALVE COMPONENTS





FEED FORCE

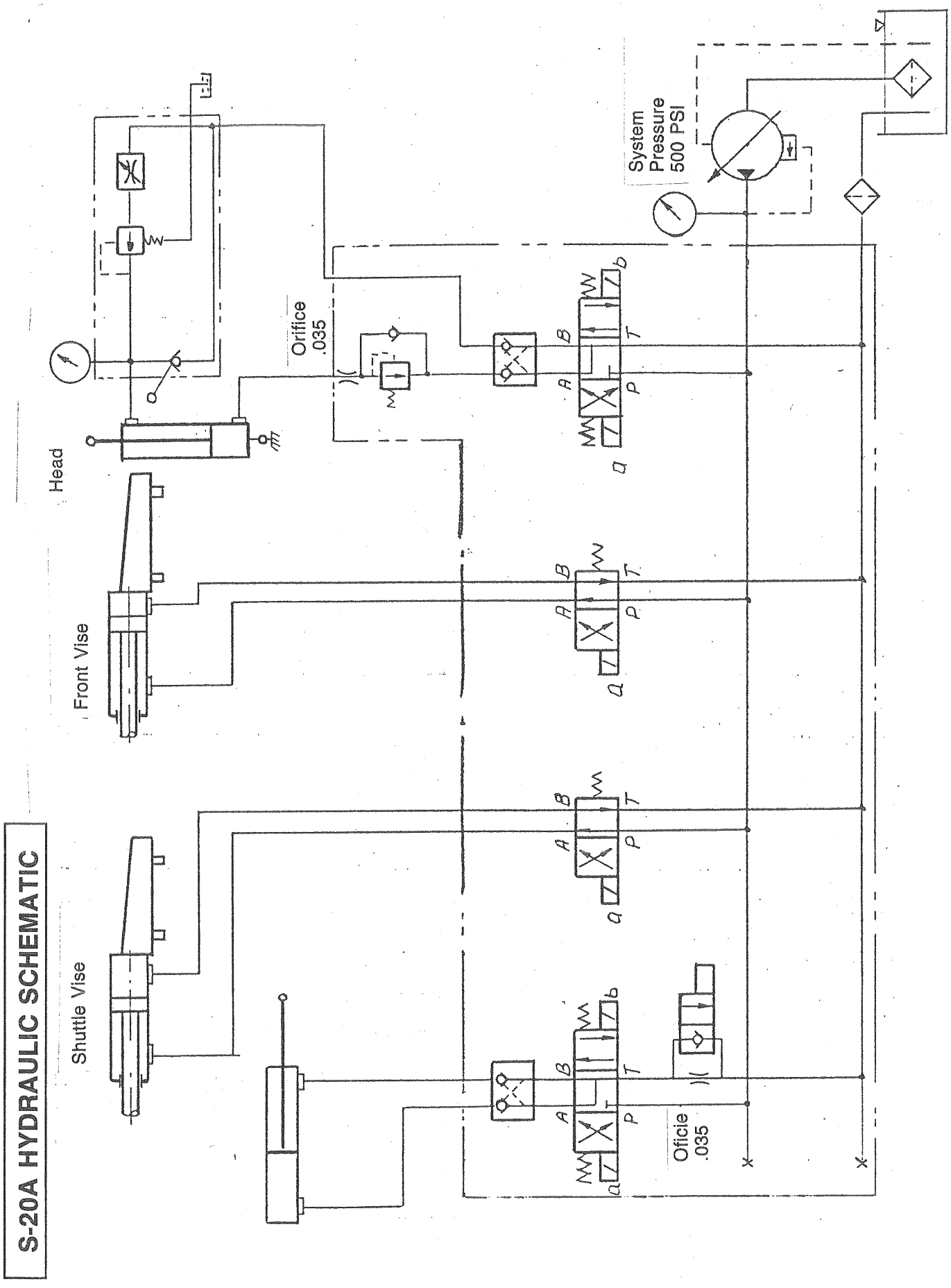
661-05 Spool
Spring XHP-2
661-06 Spring Guide
661-02 Needle
1/2" OD x 1/16" W "O" Ring
661-04A Front Plate
661-03 Knob
2 of (10-24 x 3/4" LG
PH HD Bolt)

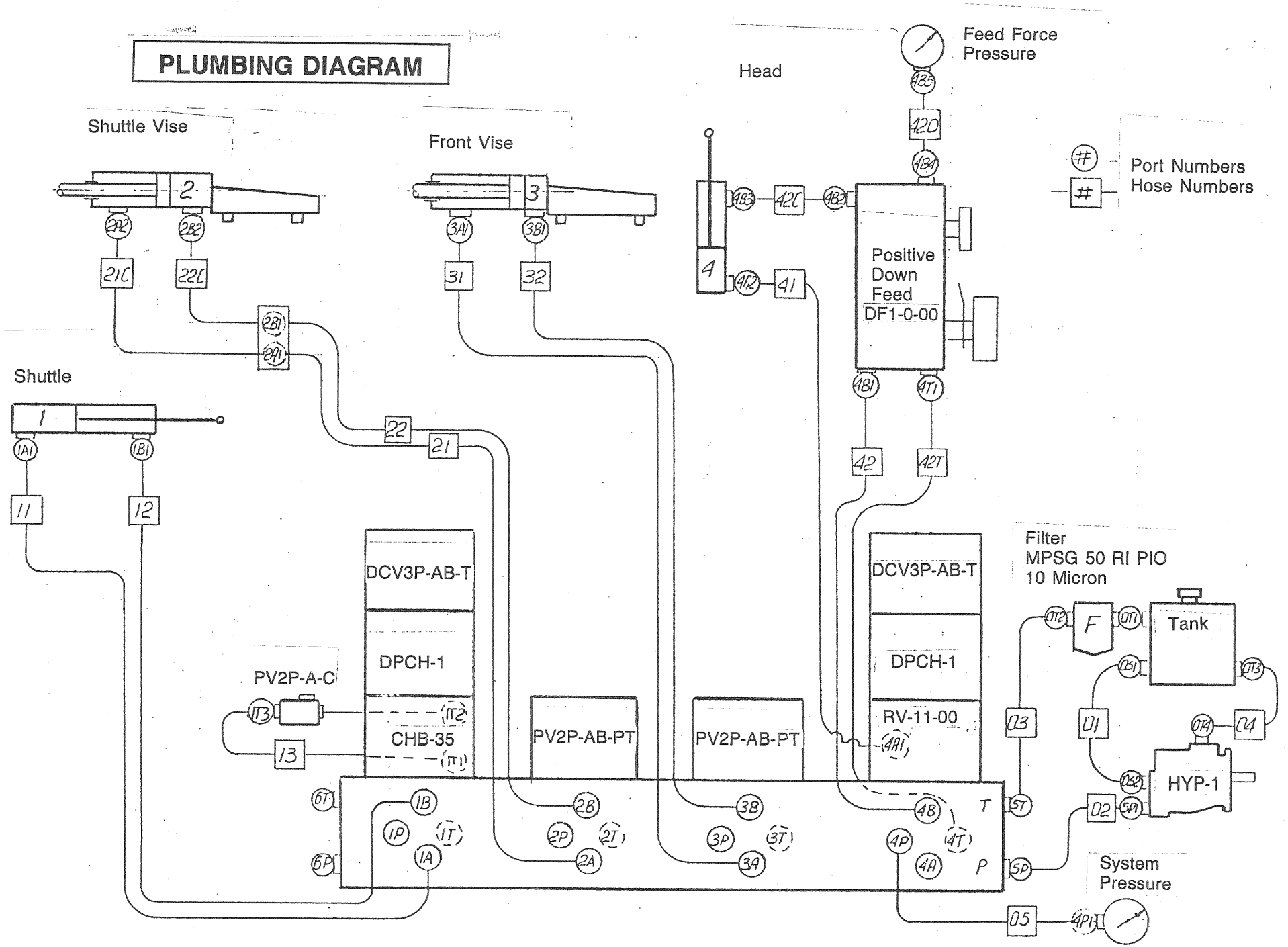
FAST APPROACH

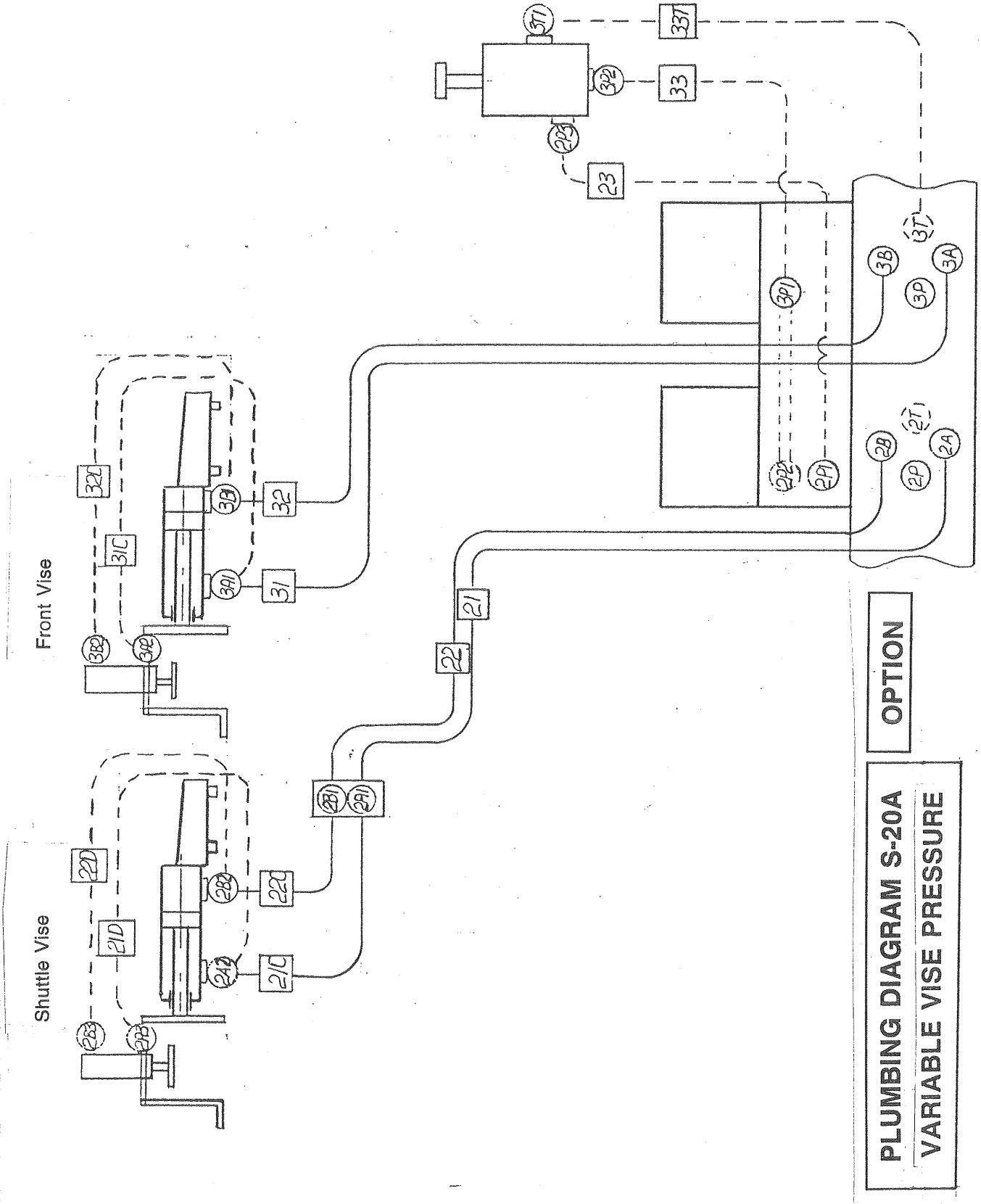
661-18A Screw
661-15 Pusher
CO457-066-0191 Spring
1/8" DIA. Ext. Snap Ring
661-16 Shaft
661-17 Pushing Finger
3/32" DIA x 3/8" LG Roll Pin
2 of (3/8" DIA Ext. Snap Ring)
1/8" DIA x 2" LG Roll Pin

1/4" OD x 6" LG Plastic Tube
Brass 90° Elbow
1/4" NPT x 1/4" Tube
Gauge Mtg. Bracket
0-500 PSI
Pressure Gauge
661-01B Manifold
4 of 1/4" NPT Plug
1/4" DIA Bearing Ball
Spring TP586
Spring TP585
661-20 "O" Ring Plug
661-21 Spring Guide
661-22A Spool
3/8" OD x 1/16" W "O" Ring &
3/8" DIA Ext. Snap Ring
Lever Ass'y.
Feed Rate
Needle Ass'y
661-24
2 of 45° Elbow
1/8" NPT x 1/4" JIC
661-25 Box
2 of 1/4" NC x 1 1/2" LG Bolt &
1/4" L/Washer
10-24 x 1 1/4" LG Socked HD Bolt
1/4" OD x .700 LG Copper Tube & Washer
2 of (661-27 Mtg Spacer)

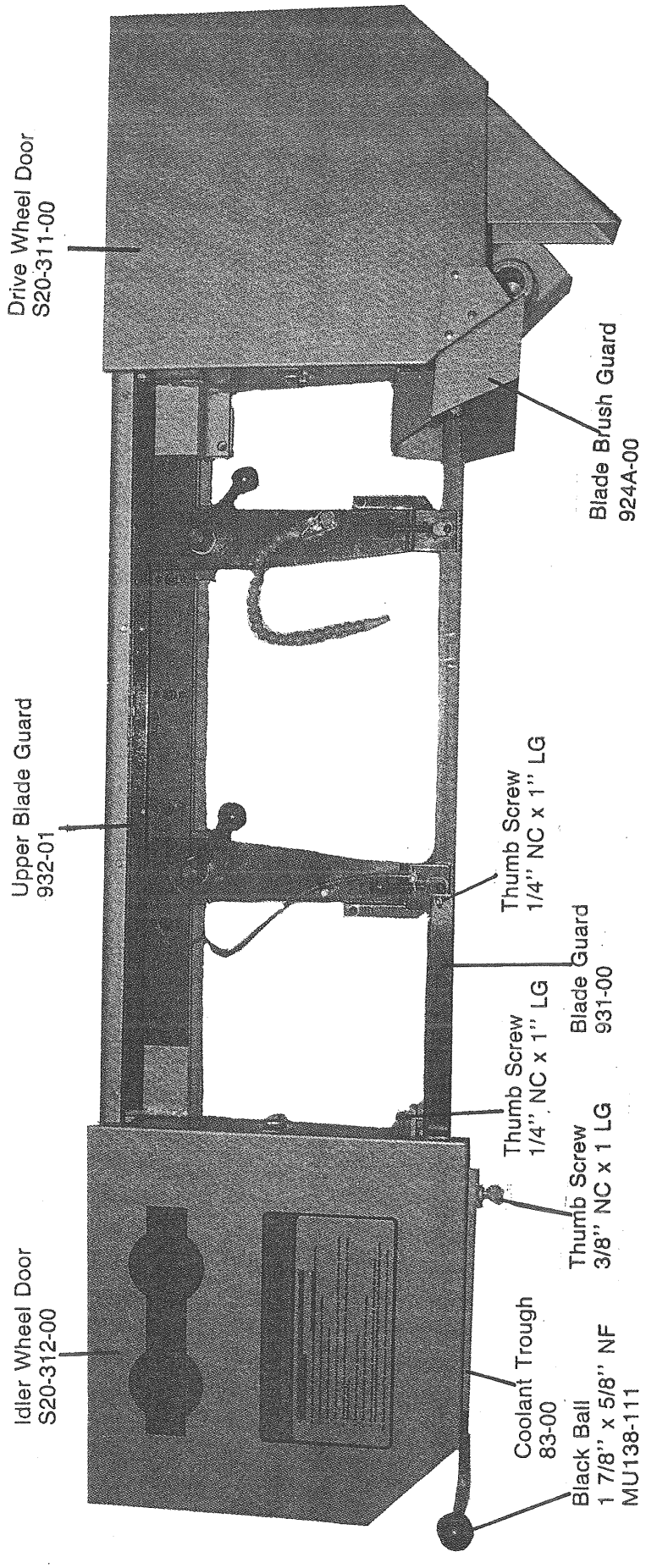
S-20A HYDRAULIC SCHEMATIC




PLUMBING DIAGRAM
Shuttle Vise
Front Vise
Head
Feed Force
Pressure
Port Numbers
Hose Numbers
Positive
Down
Feed
DF1-0-00
Shuttle
DCV3P-AB-T
DPCH-1
CHB-35
PV2P-A-C
PV2P-AB-PT
PV2P-AB-PT
DCV3P-AB-T
DPCH-1
RV-11-00
Filter
MPSG 50 RI PIO
10 Micron
Tank
HYP-1
System
Pressure


Front Vise
Shuttle Vise
PLUMBING DIAGRAM S-20A
VARIABLE VISE PRESSURE
OPTION

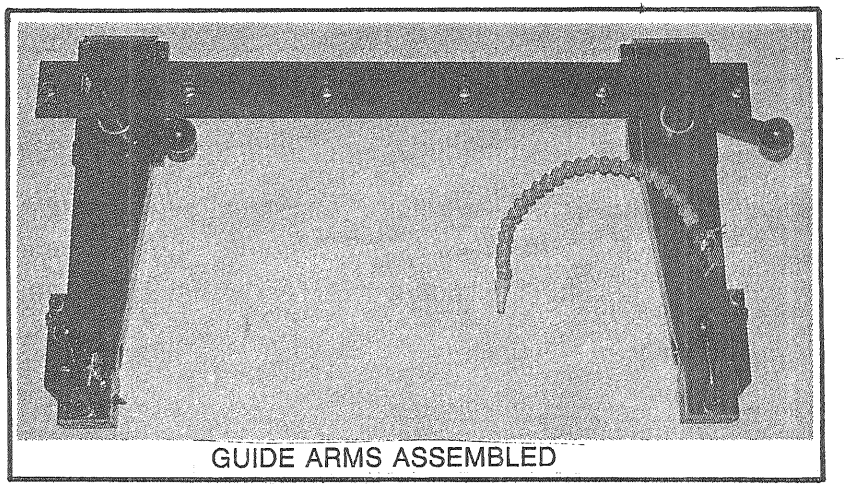
HEAD FRAME ASSEMBLY

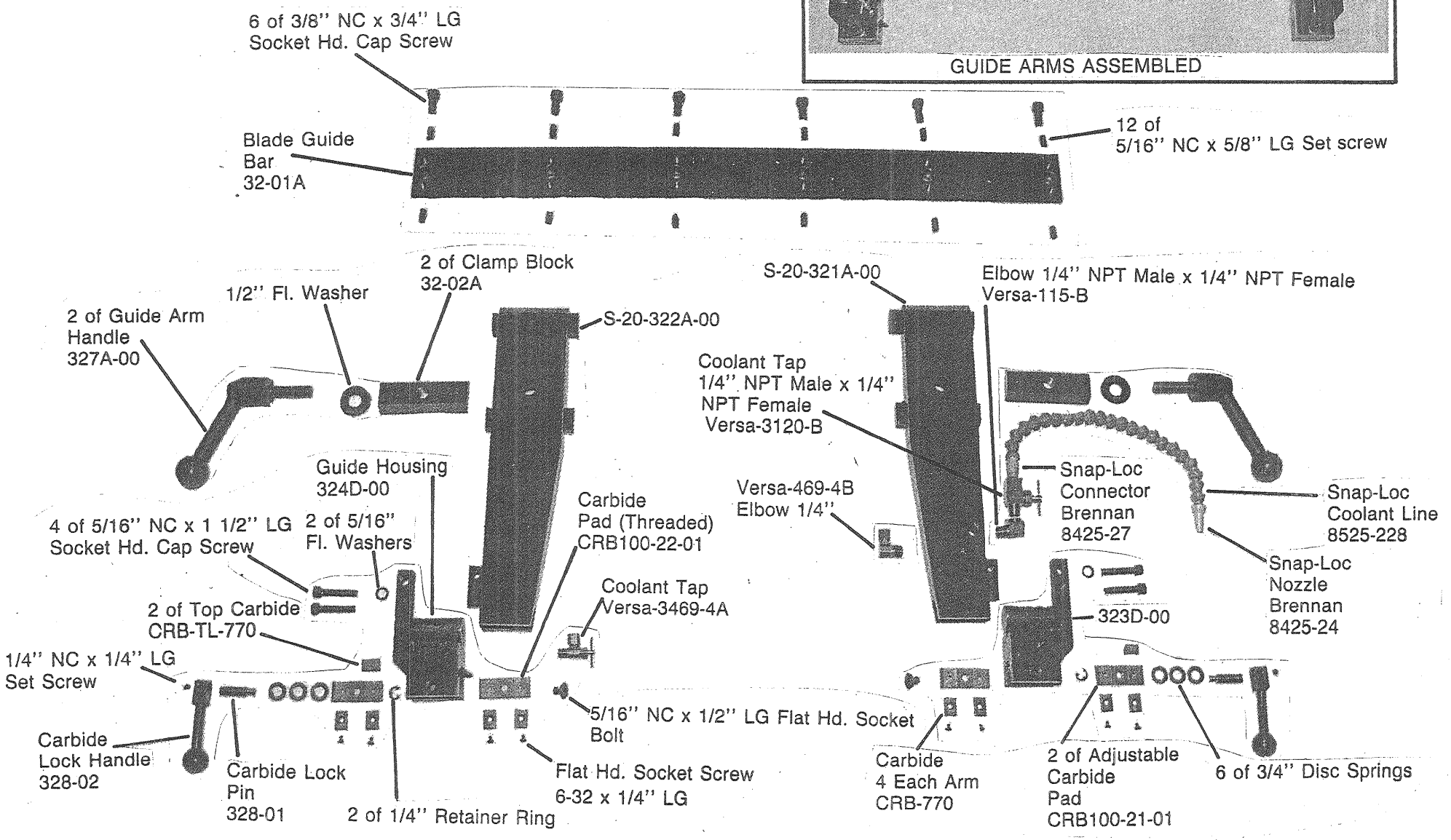


GUIDE ARM ASSEMBLY

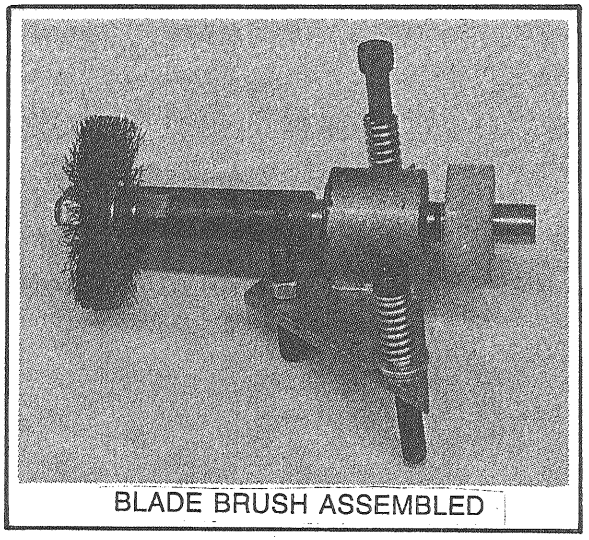
*NOTE: ASSEMBLED CARBIDE GUIDES
1 1/4" Blade (OPTION) Front Guide CRB125-21-00
Rear Guide CRB125-22-00

1" Blade Front Guide CRB100-21-00
Rear Guide CRB100-22-00

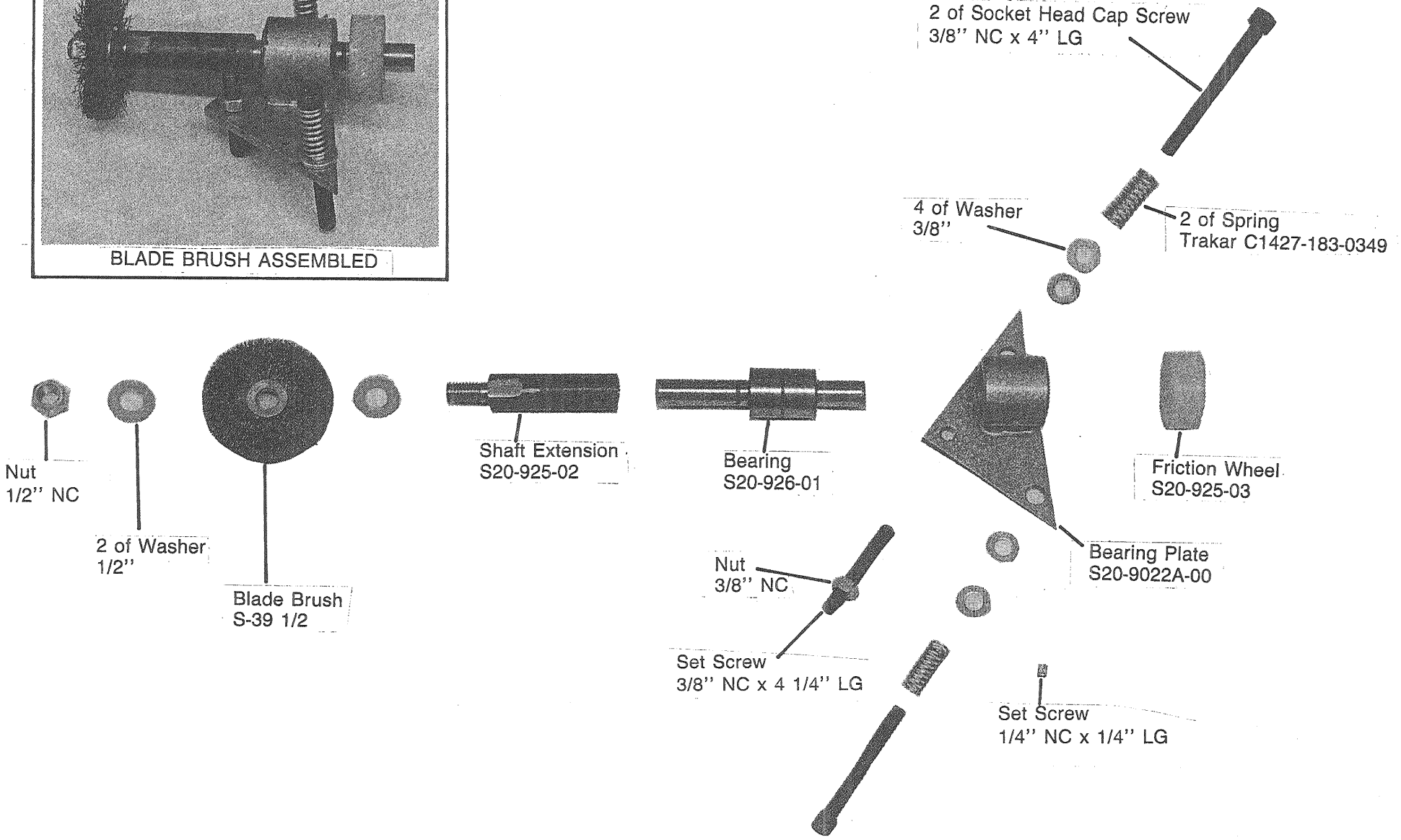

GUIDE ARMS ASSEMBLED



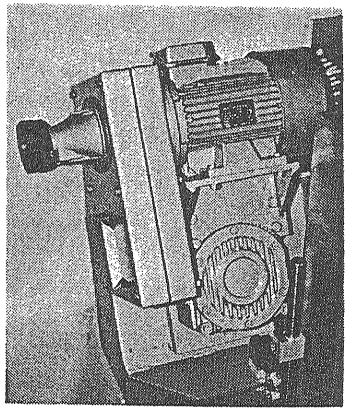
BLADE BRUSH ASSEMBLY



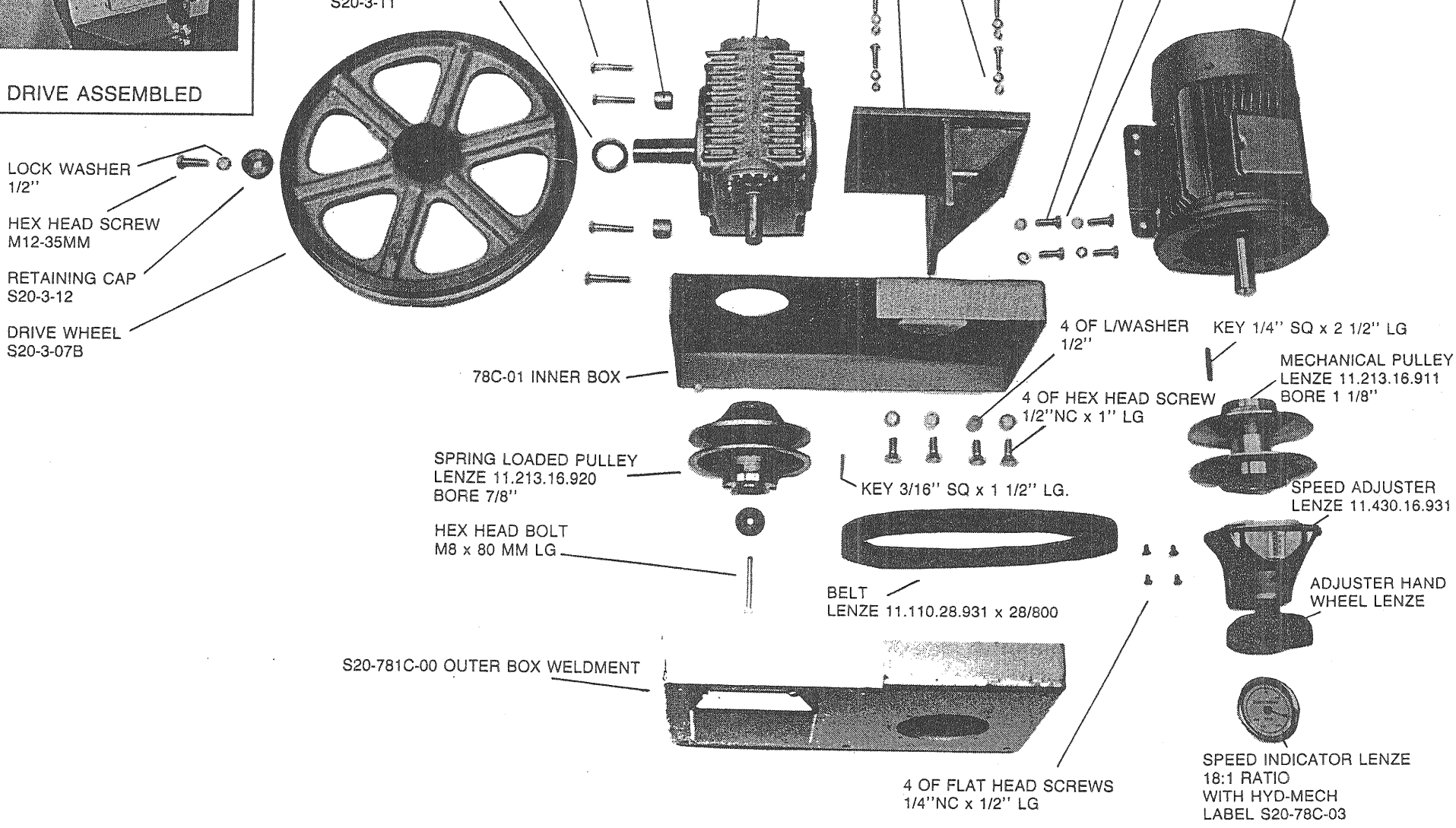
BLADE BRUSH ASSEMBLED



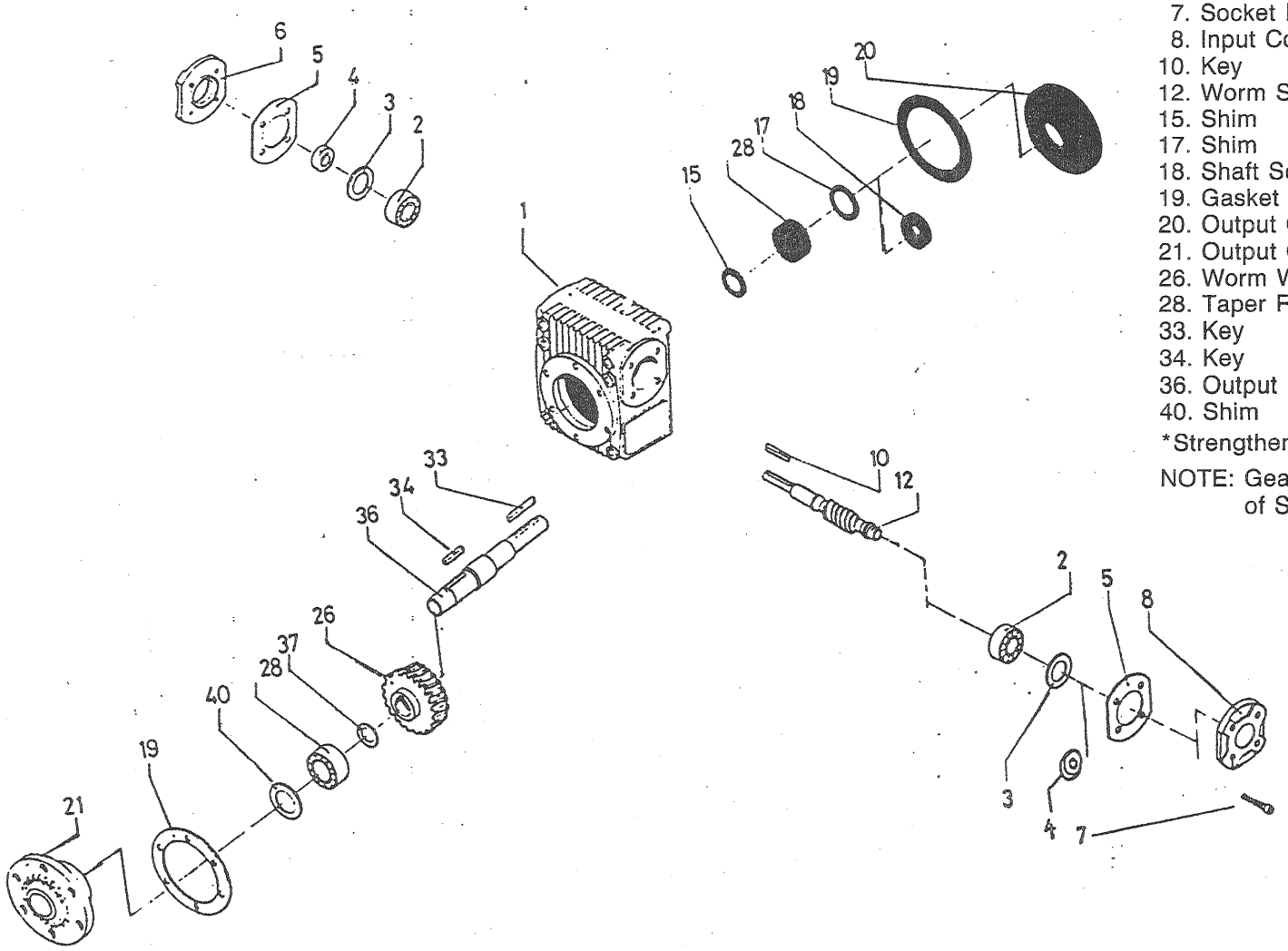
3HP DRIVE ASSEMBLY



DRIVE ASSEMBLED



S-20A 3HP GEAR BOX



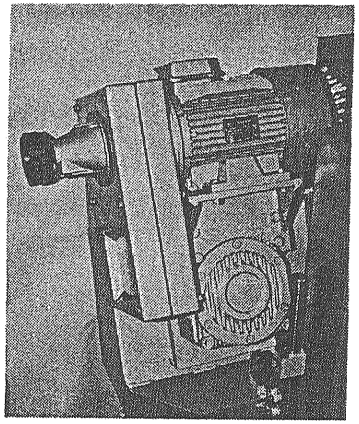
GEAR BOX COMPONENT LIST

1. Housing
2. Taper Roller Bearing #31306
3. Shim
4. Shaft Seal #A30x47x7
5. Gasket
6. Input Cover - Open
7. Socket Head Cap Screw
8. Input Cover - Closed
10. Key
12. Worm Shaft
15. Shim
17. Shim
18. Shaft Seal #A40x55x7
19. Gasket
20. Output Cover - Open
21. Output Cover - Closed
26. Worm Wheel
28. Taper Roller Bearing* #30208
33. Key
34. Key
36. Output Shaft
40. Shim

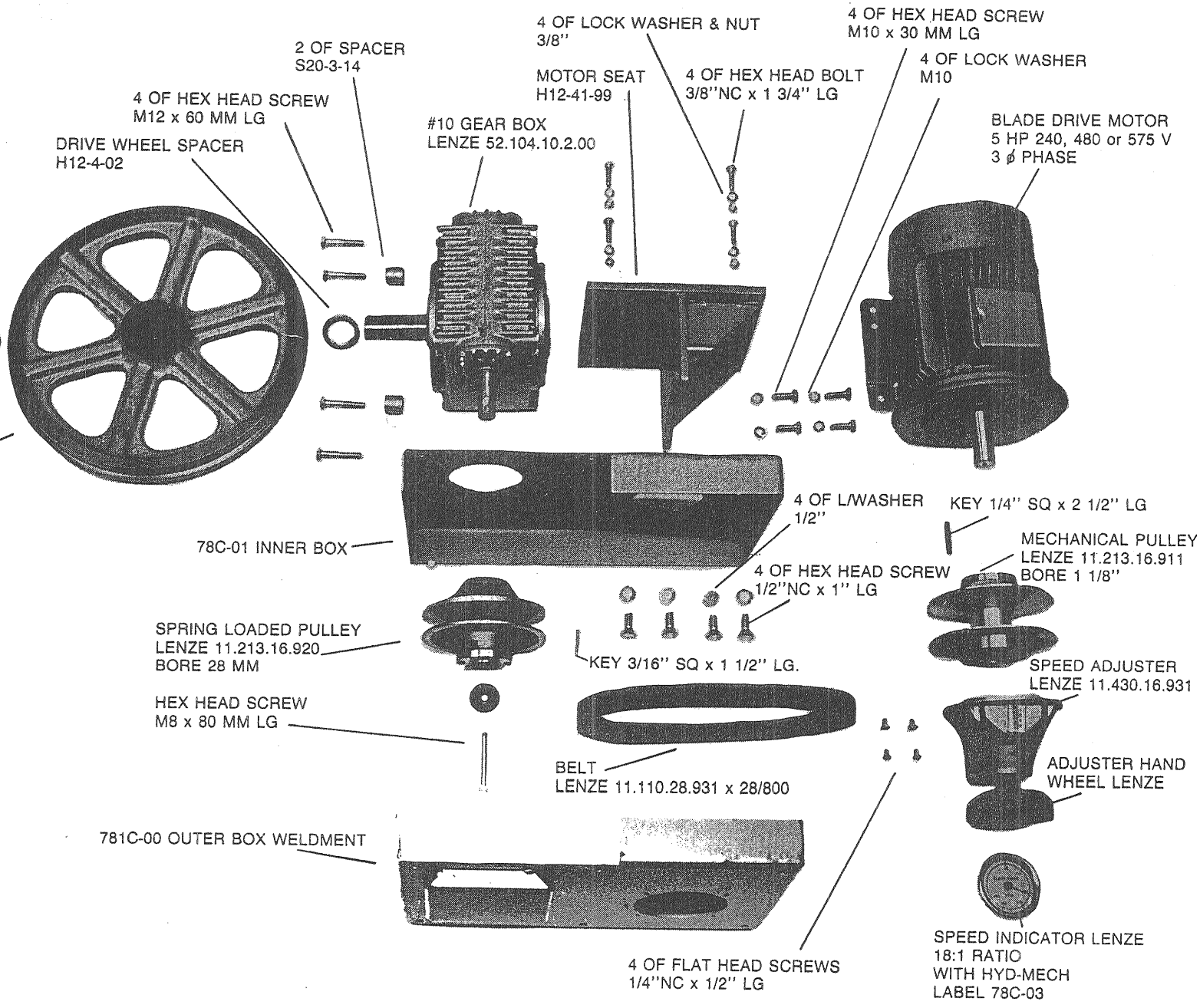
*Strengthened bearings on output

NOTE: Gear Box is filled with 1.8 liters of Shell Tivela WB oil.

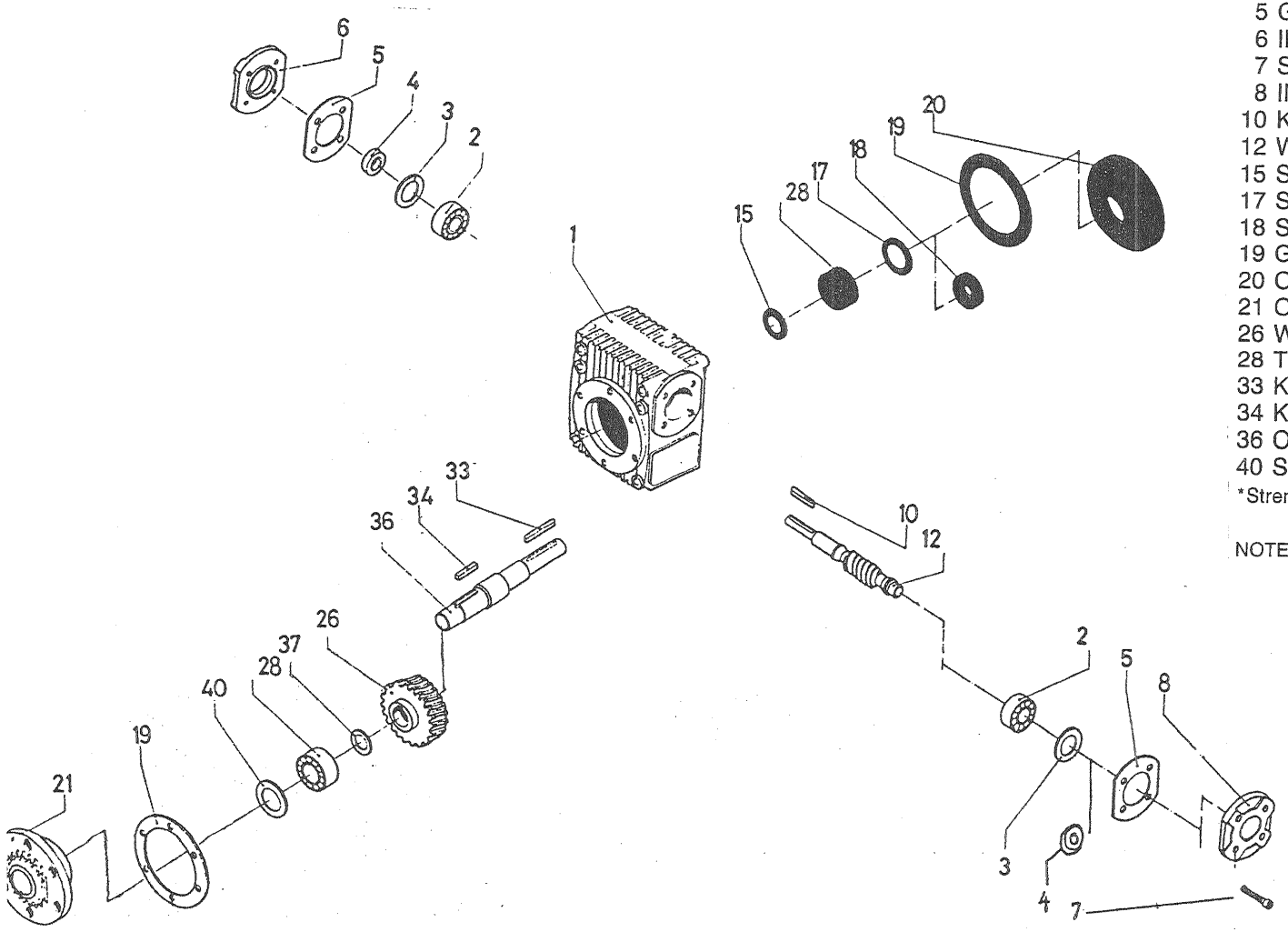
5HP DRIVE ASSEMBLY | OPTION



DRIVE ASSEMBLED



S-20A 5HP GEAR BOX | OPTION



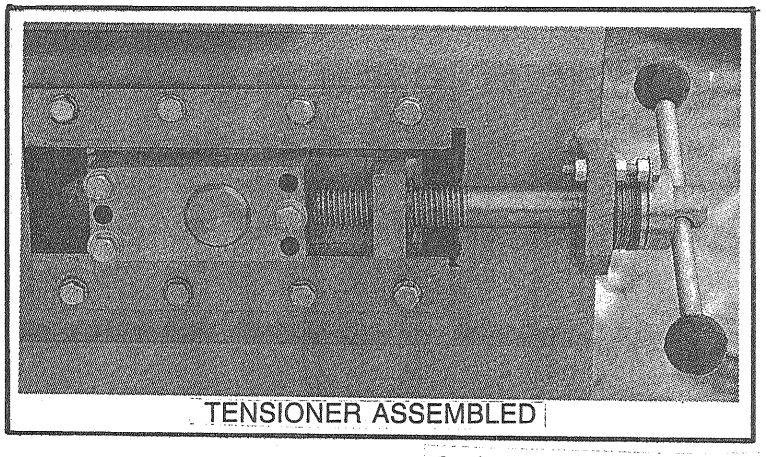
GEAR BOX COMPONENT LIST

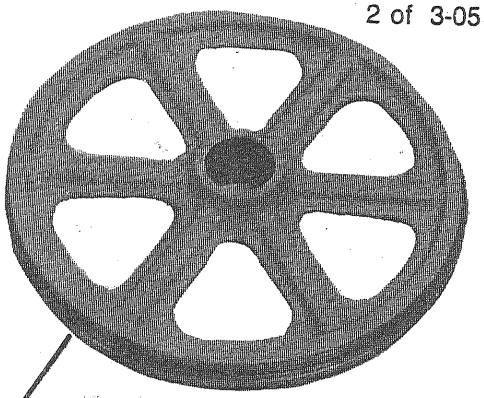
1 HOUSING
2 TAPER ROLLER BEARING #31307
3 SHIM
4 SHAFT SEAL #A35x52x7
5 GASKET
6 INPUT COVER - OPEN
7 SOCKET HEAD CAP SCREW
8 INPUT COVER - CLOSED
10 KEY
12 WORM SHAFT
15 SHIM
17 SHIM
18 SHAFT SEAL #A50x72x8
19 GASKET
20 OUTPUT COVER - OPEN
21 OUTPUT COVER - CLOSED
26 WORM WHEEL
28 TAPER ROLLER BEARING* #30310 & 32210
33 KEY
34 KEY
36 OUTPUT SHAFT
40 SHIM

*Strengthened bearings on output

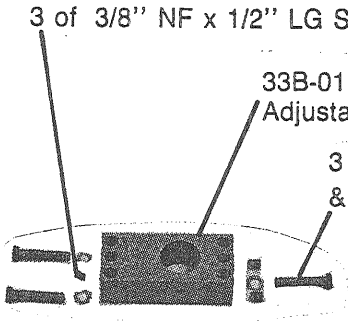
NOTE: GEAR BOX IS FILLED WITH 2.5 LITERS OF SHELL TIVELA WB OIL.

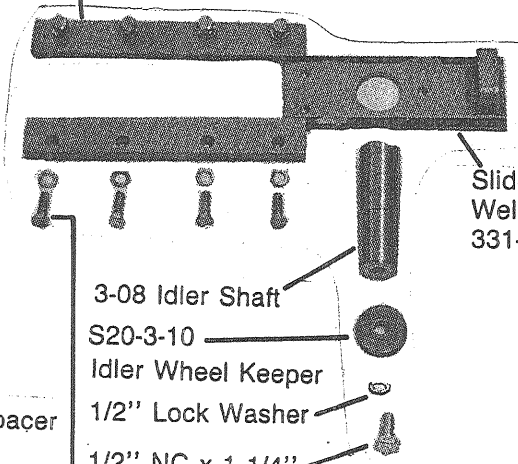
IDLER WHEEL ASSEMBLY

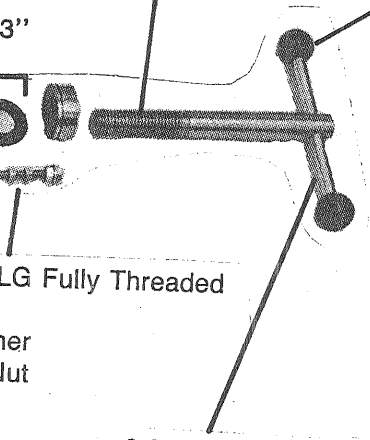

TENSIONER ASSEMBLED


S20-3-06 Idler Wheel

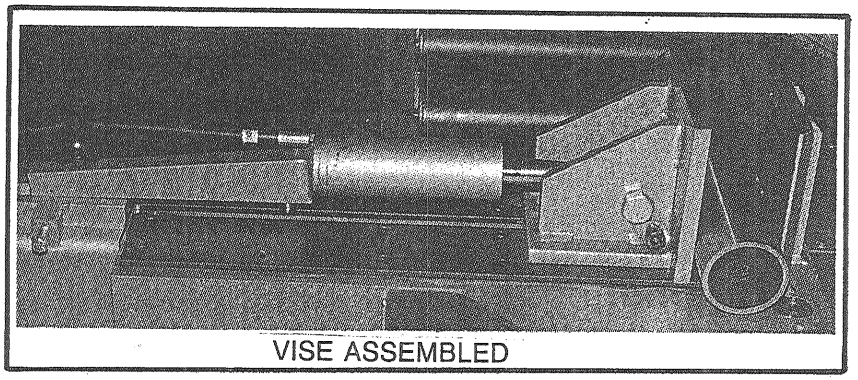

Ball Bearing, 6207
3-09 Idler Wheel Spacer
Snap Ring
N5000-244


3 of 3/8" NF x 1/2" LG Set Screw
33B-01
Adjustable Idler Wheel Block
3 of 3/8" NF x 2" LG Hex Hd. Bolt
& Lockwasher
2 of 3-05 Idler Mount Guide


6 of Disc Spring
1" ID. x 2" OD. x 0.093"
Slider Base
Weldment
331-00
3-08 Idler Shaft
S20-3-10
Idler Wheel Keeper
1/2" Lock Washer
1/2" NC x 1 1/4"
LG Hex Hd. Bolt
8 of 3/8" NC x 1 1/4" LG Hex Hd. Bolt
3/8" L/Washer

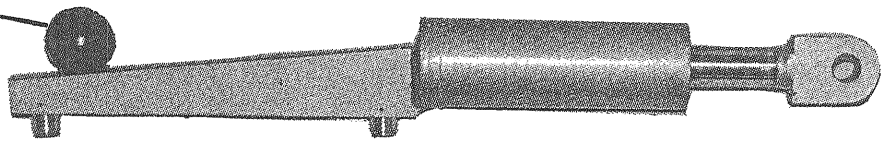

MU138-95
1 3/8" Black Knot
3-02 Blade Tensioner Shaft
5/16" NC x 2" LG Fully Threaded
Hex Hd. Bolt
1 of 5/16" Washer
3 of 5/16" NC Nut
3-04 Blade Tensioner Handle

SLIDING VISE ASSEMBLY



VISE ASSEMBLED

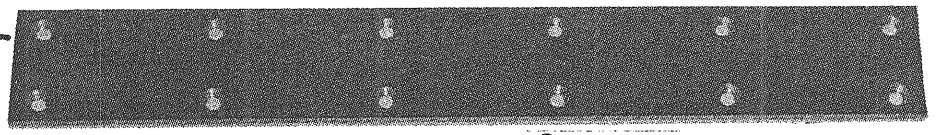
1 7/8" DIA x 5/8" NF Ball
MU138-11



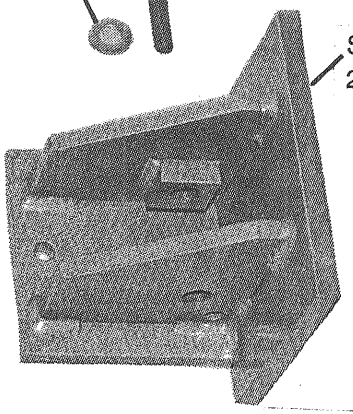
3/4" L/Washer

3/4" NC Nut

(Infeed) Wear Plate
S20-20-01



Sliding Vises
22-00



Bottom Vise Guide
2-05

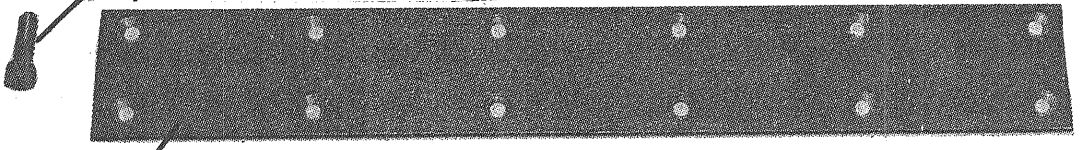
Shim
S20-2-06

Center
Vise Guide
2C-04

1/2" L/Washer

1/2" Fl/Washer

1/2" NF x 1 1/4" LG Socket Head Bolt



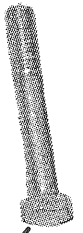
2 of 1/2" NF x 2" LG
Socket Head Bolt

1/2" NF x 1 1/4" LG
Bolt

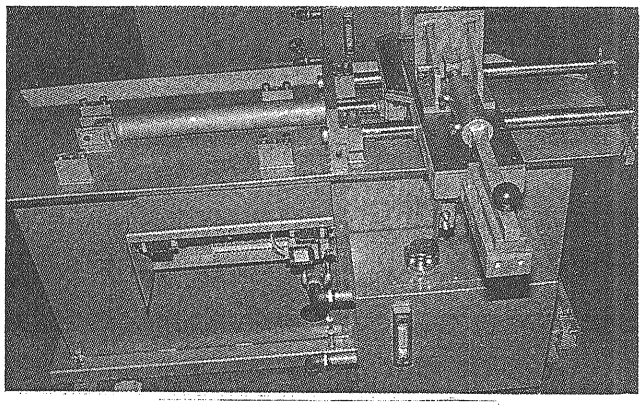
(Outfeed) Wear Plate
S20-20-02

24 of 5/16" NC x 1/2" LG
Flat Head Socket Bolt

3/4" NC x 5" LG Bolt



SHUTTLE VISE ASSEMBLY



SHUTTLE ASSEMBLED

2 of Wear Strip
A20-2-01

Vise Cylinder

Shuttle Table
A20-2-00

Anti-Tip Wear Strip
A20-2-02

2 of 7/16''-20 Jam Nut

2 of Shuttle Cylinder Pin
S25-625-00

2 of Bulkhead 90° Elbow
1/4'' JIC to 1/4'' JIC

5/16'' NC x 1/2'' Flat Head
Socket Bolt

2 of Shuttle Shaft
A20-1-01

Shuttle Cylinder
S20-64-00

4 of 1 3/4'' x 1 Wear Ring
(2 each housing)

4 of Wiper/Seal H1500
2 each housing

4 of 3/8'' NC x 3 1/4'' LG Bolt

4 of 3/8'' NC x 1 1/4'' LG
Socket Head Set Screw

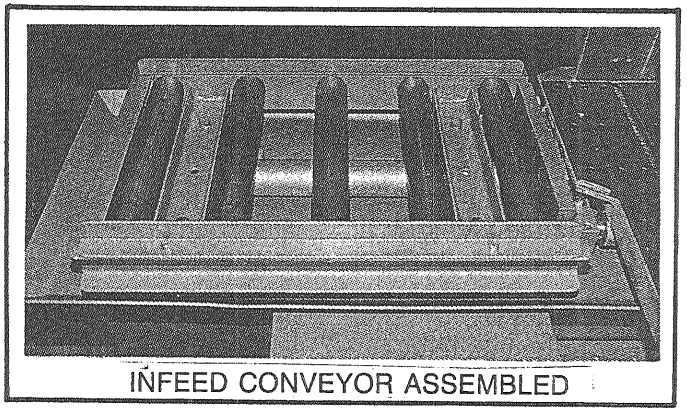
4 of 3/8'' L/Washer

4 of 3/8'' Fl. Washer

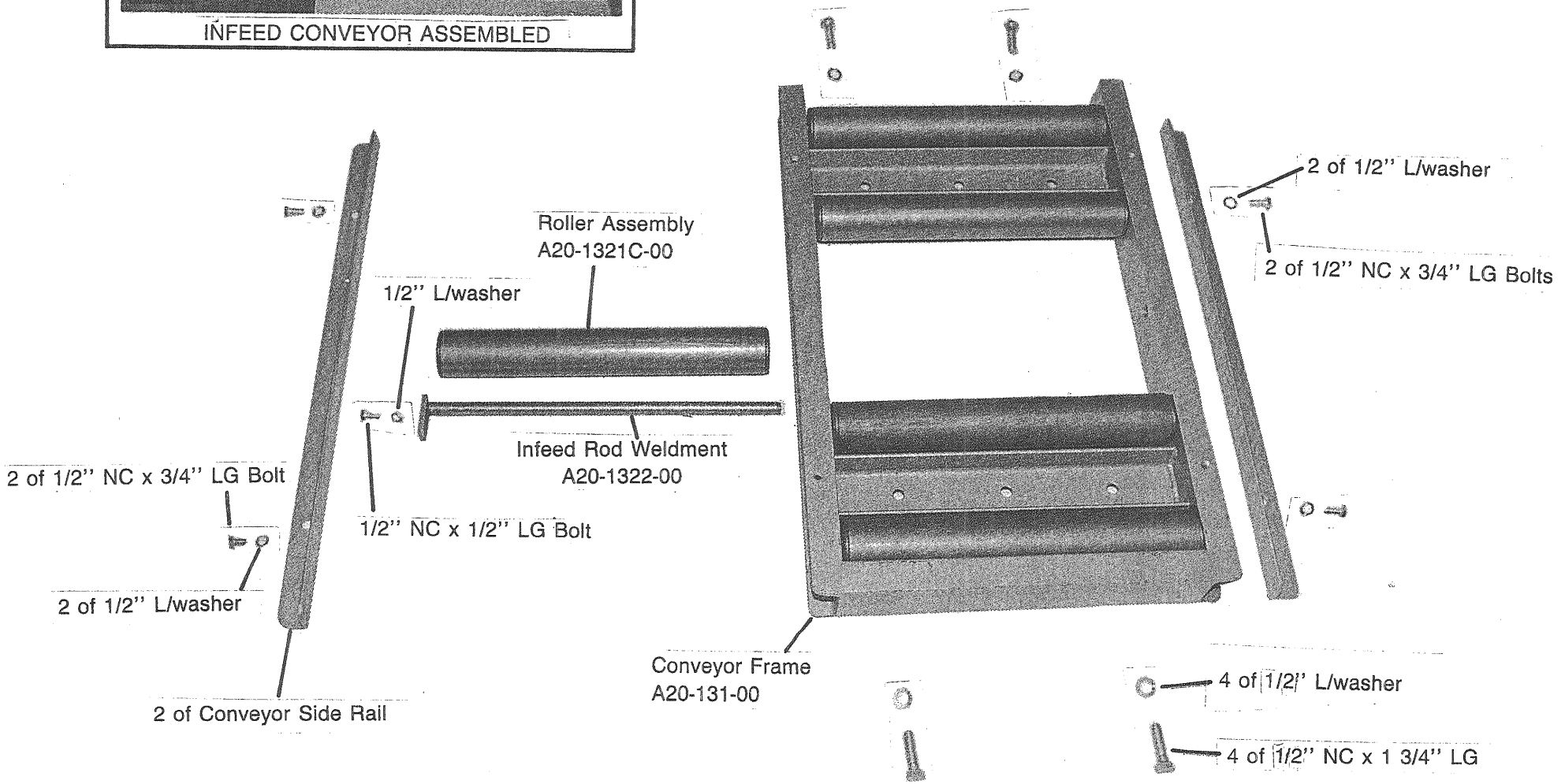
Shaft Block
A20-14-00

2 of 3/8'' NC x 1/2'' LG
Socket Head Set Screw

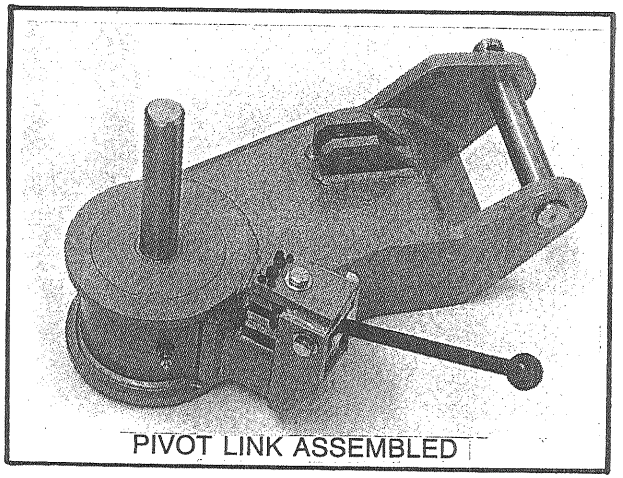
INFEED CONVEYOR ASSEMBLY



INFEED CONVEYOR ASSEMBLED



PIVOT LINK ASSEMBLY


PIVOT LINK ASSEMBLED

Pivot Pin
4-01

Pivot Link
41-00

5/16" NC x 3/8" LG
Set Screw

Eccentric Shaft
3-01

Pointer 43B-02

Angle Scale
9-01A

4 of
1/4" NC x 3/4" LG Set Screw

1/2" NC x 2" LG Hex Hd. Bolt

Brake Tongue
422-00

1/2" Fl. Washer

Brake Shoe
42-03

1/2" NC Nut

1/2" L/Washer

Cam S20-42B-02

Lock Handle

1 3/8" DIA. x 1/2" NC Ball
MU138495

4-02
Thrust Bearing

1/8" NPT Str.
Grease Fitting

1/8" x 2" LG Nipple

2 of 5/32" x 3/8"
Soc. Hd. Cap Screw

2 of 5/32" Fl. Washer

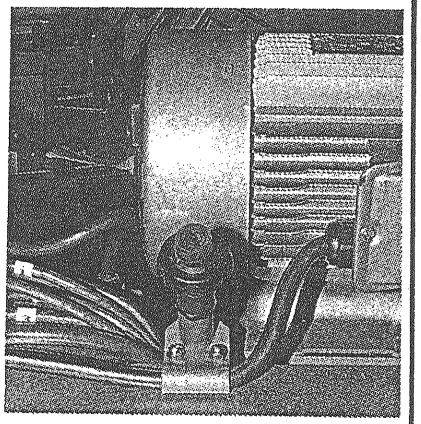
2 of 5/16" NC x 1" LG
Socket Hd. Cap Screw

1/2" NC Lock Nut

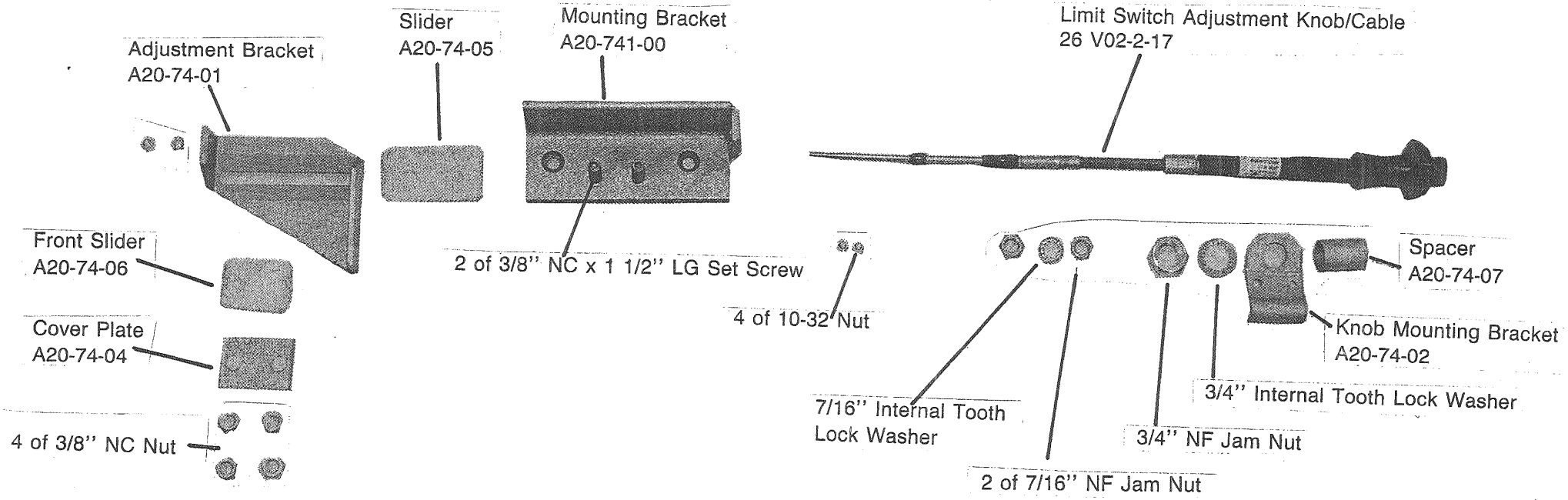
1/2" Fl. Washer

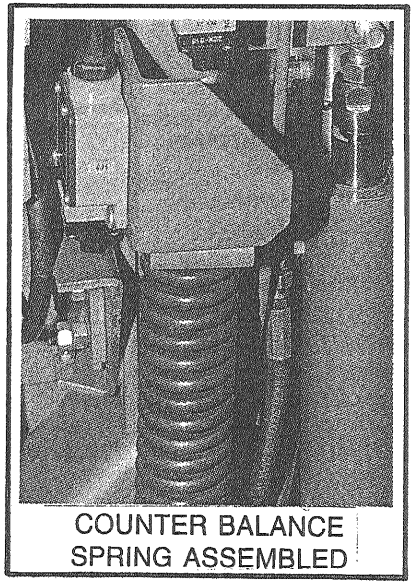
1/2" NF x 3 1/2" LG Hex Hd. Bolt

HEAD UP LIMIT SWITCH ADJUSTMENT ASSEMBLY



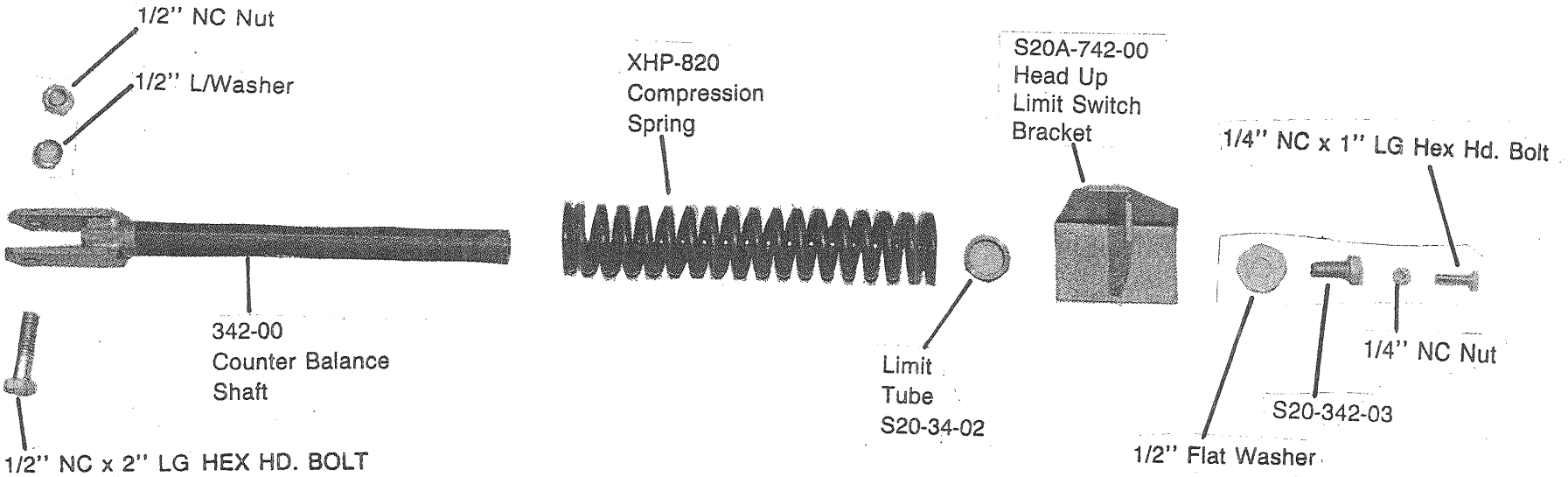
HEAD UP LIMIT SWITCH
ADJUSTOR ASSEMBLED



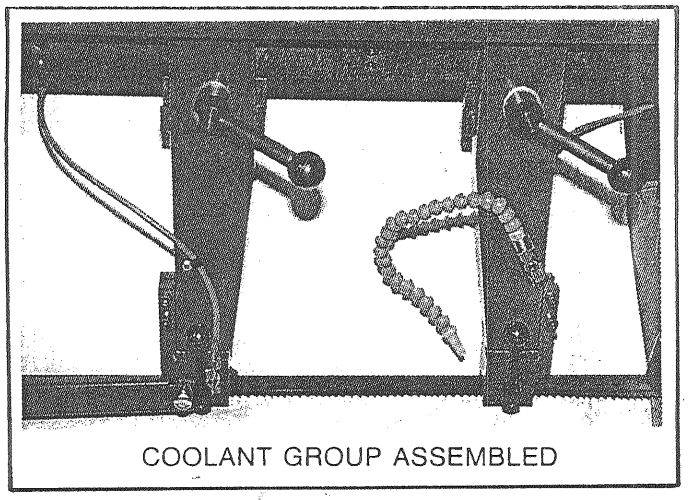


COUNTER BALANCE SPRING ASSEMBLED

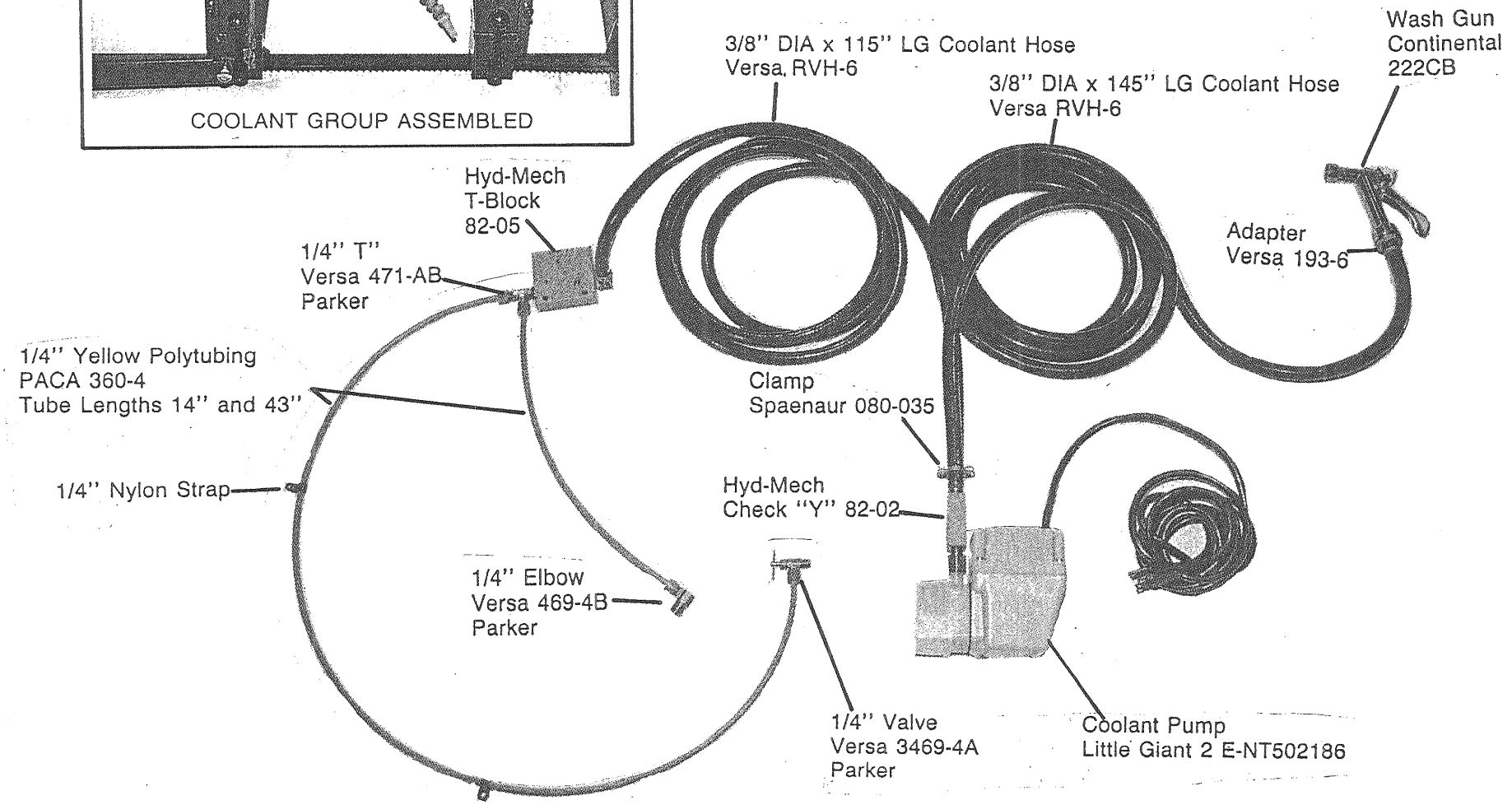
COUNTER BALANCE SPRING ASSEMBLY



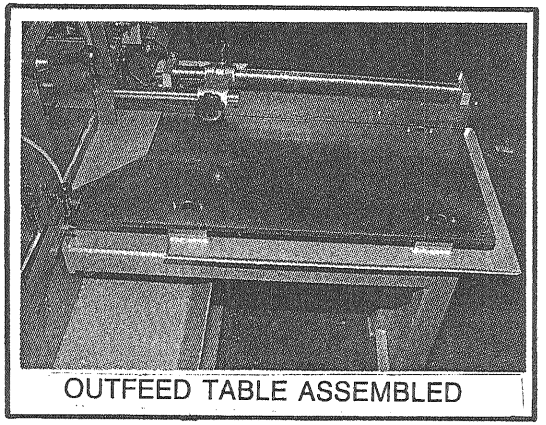
COOLANT GROUP



COOLANT GROUP ASSEMBLED

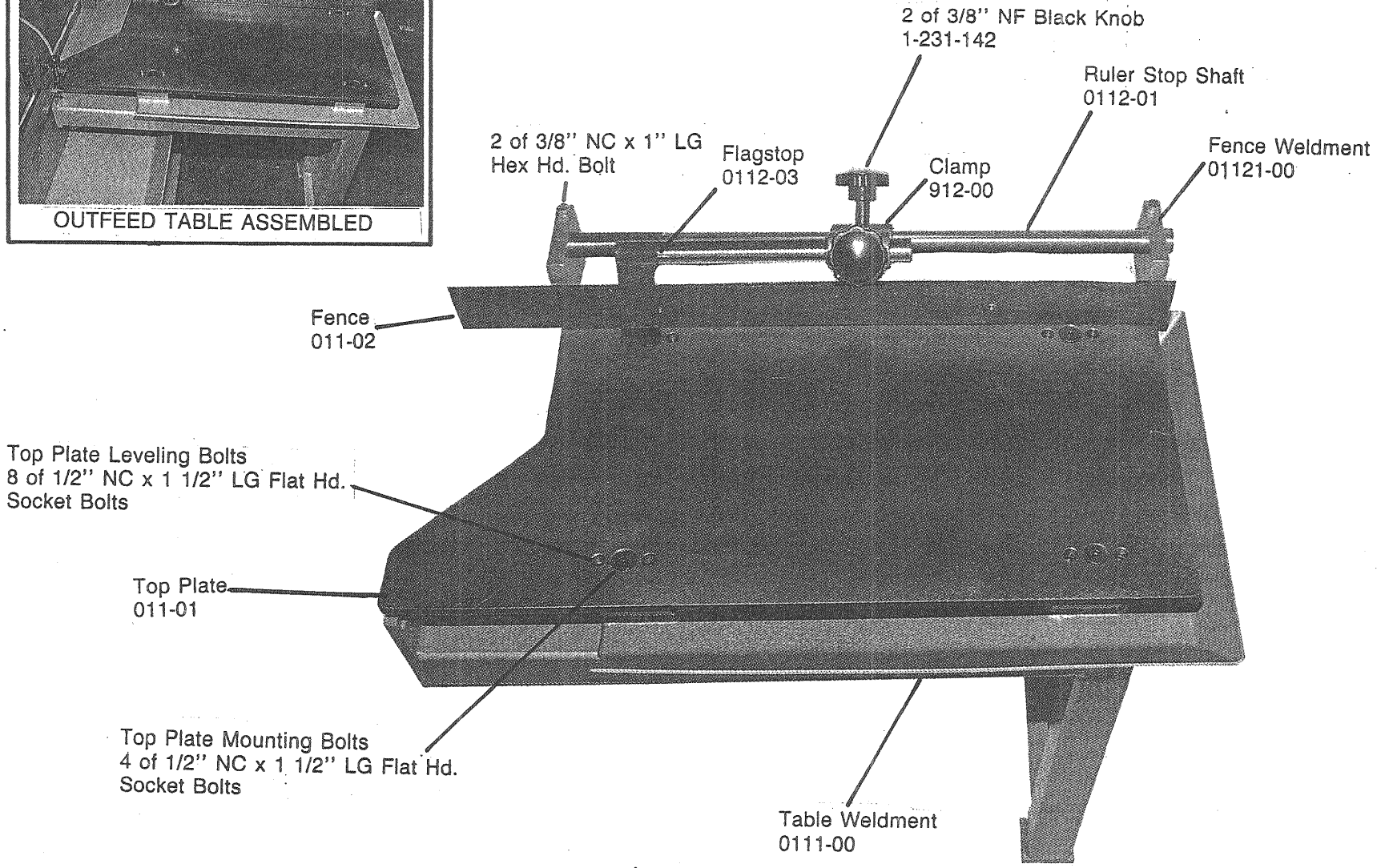


*NOTE: Coolant Tank Not Shown

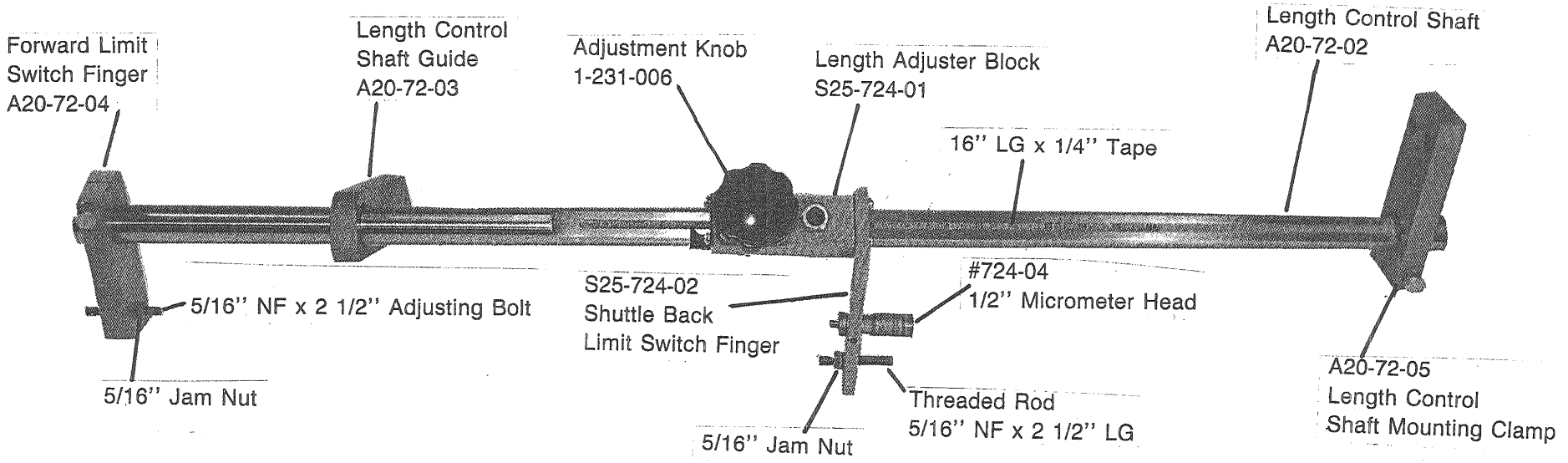


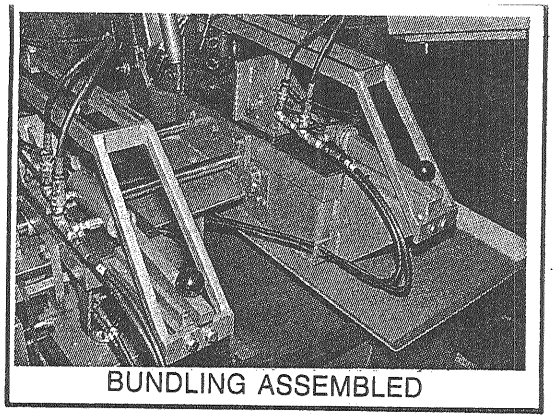
OUTFEED TABLE ASSEMBLED

OUTFEED TABLE



LENGTH CONTROL





BUNDLING ASSEMBLED

Top Frame Weldment
A20-551-00

Cylinder Clamp
Handle A20-554

2 of 3/8" NC x 3" LG
Hex Hd. Bolt

Bundling Cylinder Clamp
Weldment S20-555-00

Front Post
Weldment
A20-552-00

2 of 1/2" NC x 1 1/2" LG
Hex Hd. Bolt

2 of Dust Plug

2 of 90° Street Elbow
1/4" NPT Male
1/4" NPT Female

2 of Street Tee
1/4" NPT Female
1/4" NPT Male

2 of Male Adapter
1/4" NPT Male
1/4" Male (JIC) 37°

Male Pipe Nipple
1/4" NPT Male
1/8" NPT Male

2 of Hose End
1/4" (JIC) 37° Swivel
For 1/4" Hose

Male Adapter
1/4" Male (JIC) 37°
1/8" NPT Female

Bundling
Cylinder
A20-556-00

1/4"-18 Quick
Disconnect
Coupler

2 of 1/4"-18 Quick
Disconnect Nipple

1/4" Close Nipple
Reducing Adapter
1/8" NPT Male
1/4" NPT Female

1/4" Hose Length 25"
2 Pieces

Cylinder Rod
Extension
A20-55-02

90° Street Elbow
1/8" NPT Male
1/8" NPT Female

2 of 3/8" NC x 3/4" LG
Soc. Hd. Cap Screw

Jaw Carrier
A20-55-01

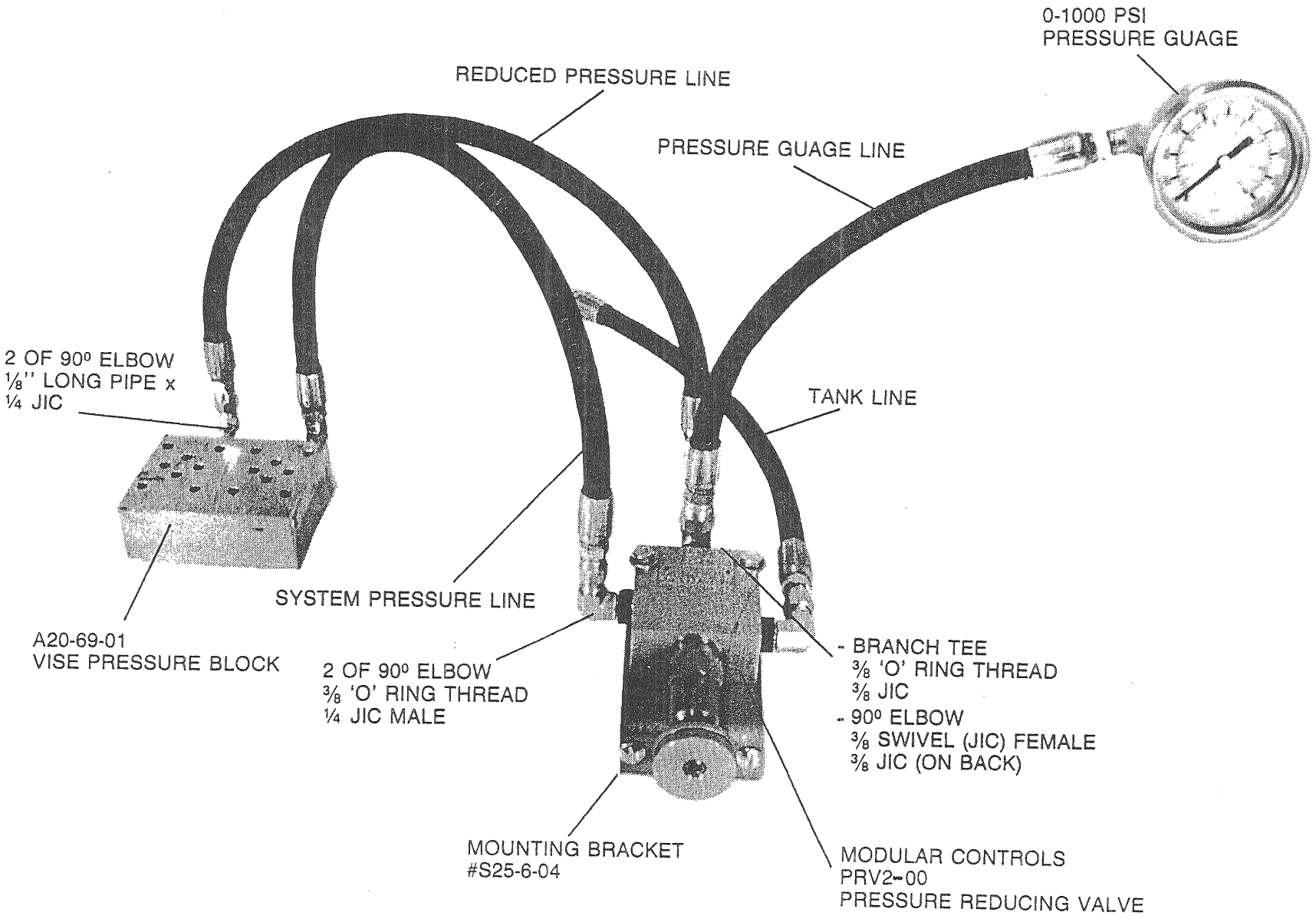
Auto Bundling Jaw
A-20-55-05

2 of 2" LG Bundling Pin

Auto Bundling Jaw
A-20-55-03

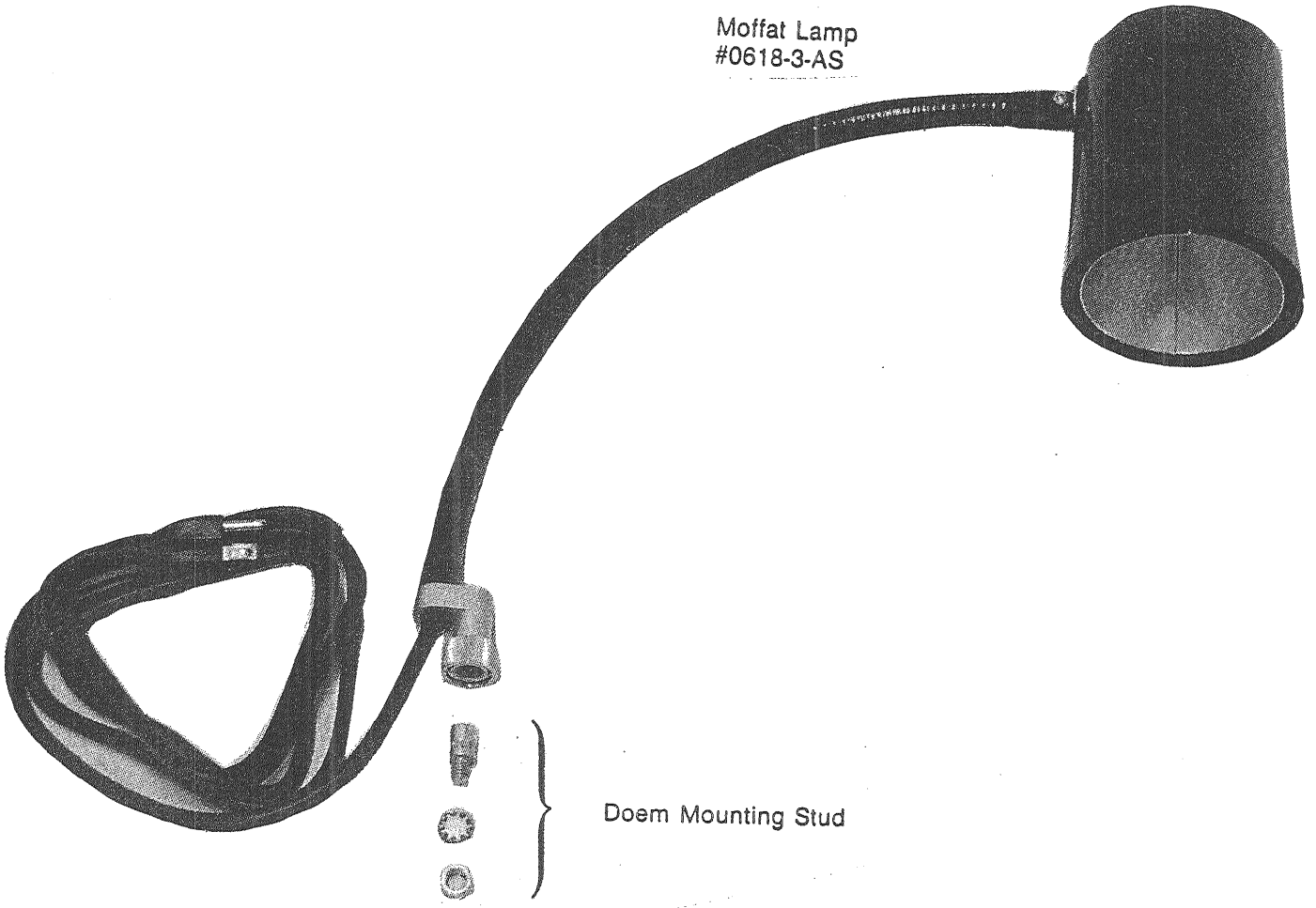
BUNDLING ATTACHMENT | **OPTIONAL**

VARIABLE VISE PRESSURE COMPONENTS (OPTIONAL)



WORK LIGHT

OPTIONAL

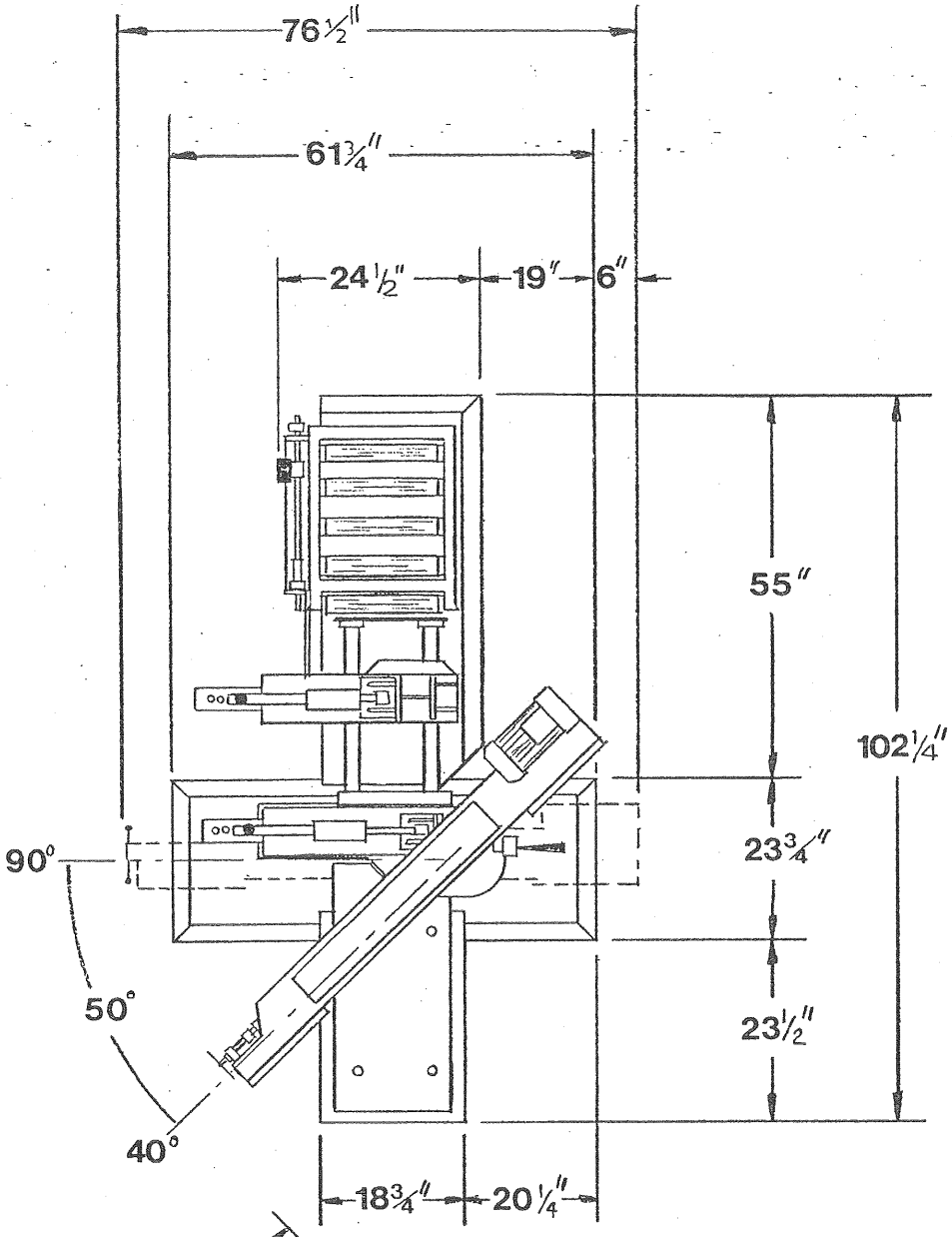


SECTION 8 — SPECIFICATIONS

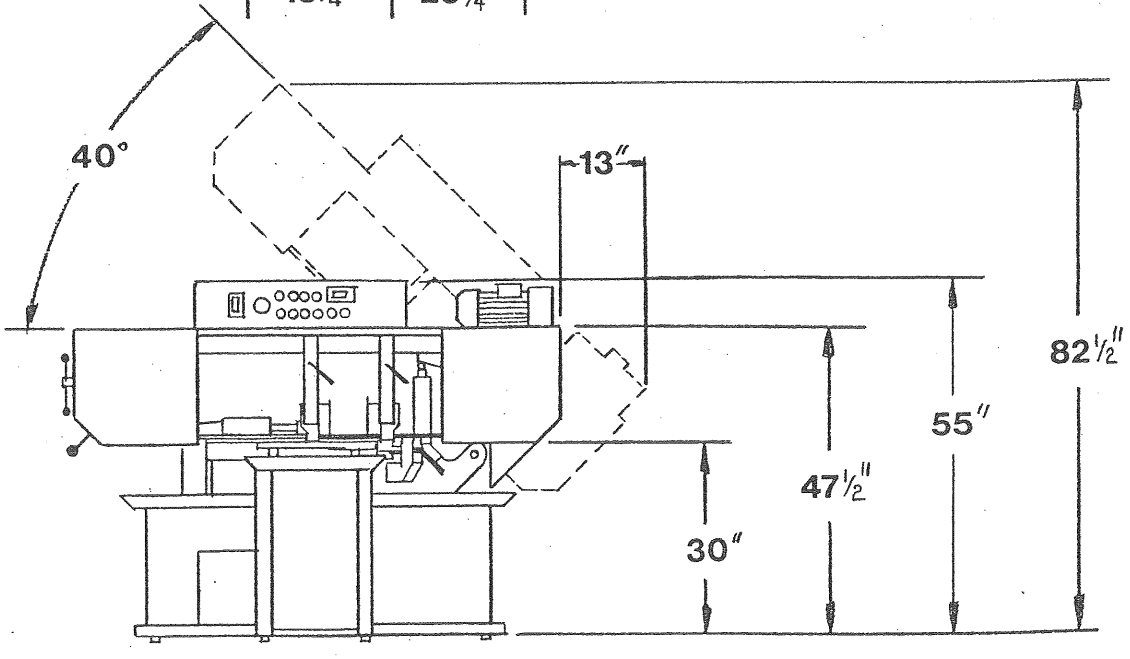
SPECIFICATION LIST

MODEL S-20A	DIMENSIONS (IMPERIAL)
Capacity: rectangular	13" high 18" wide
round	12" diameter @ 45
Blade: Length	13' 6"
Width	1"
Thickness	.032"
Blade Speed	75-400 SFM Infinitely Variable
Blade Guides	carbide
Blade Wheel Diameter	16"
Electric Motors (Blade Drive)	3HP 5 HP(optional)
(Hydraulic Pump)	2HP
Shuttle Stroke	0-16" Multi-index capability standard.
Hydraulic Pump	Pressure compensated constant pressure variable flow (6.5 GPM)
Hydraulic Reservoir	10 gallons
Hydraulic System Pressure	475 PSI
Coolant Pump	3.5 GPM (150W)
Coolant Reservoir	6 U.S. gallons
Table Height	30"
Machine Weight	2480 lbs.
Maximum Workload	4000 lbs.
Overall Dimensions	78" W x 102" L x 55" H

PLAN VIEW



FRONT VIEW



S20A INSTALLATION DIMENSIONS

SECTION 9 — WARRANTY

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

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

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

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

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

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

HYD-MECH ENGINEERING LTD.
239 Beards Lane
P.O. Box 1030
Woodstock, Ontario
N4S 8A4
Phone: (519) 537-6751