

INSTRUCTION MANUAL

BS-250

**Metal Cutting Band Saw (415V)
415 x 250mm (W x H) Rectangle**



B018

**WARNING**

1. Read and understand the entire instruction manual before operating machine.
2. Always wear approved safety glasses/face shields while using this machine.
3. Make certain the machine is properly grounded.
4. Before operating the machine, remove tie, rings, watches, other jewelry, and roll up sleeves above the elbows. Remove all loose clothing and confine long hair. Do not wear gloves.
5. Keep the floor around the machine clean and free of scrap material, oil and grease.
6. Keep machine guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately.
7. Do not over reach. Maintain a balanced stance at all times so that you do not fall or lean against blades or other moving parts.
8. Make all machine adjustments or maintenance with the machine unplugged from the power source.
9. Use the right tool. Don't force a tool or attachment to do a job which it was not designed for.
10. Replace warning labels if they become obscured or removed.
11. Make certain the motor switch is in the off position before connecting the machine to the power supply.
12. Give your work undivided attention. Looking around, carrying on a conversation, and "horse-play" are careless acts that can result in serious injury.
13. Keep visitors a safe distance from the work area.
14. Use recommended accessories, improper accessories may be hazardous.
15. Make a habit of checking to see that keys and adjusting wrenches are removed before turning on the machine.
16. Always keep hands and fingers away from the blade when the machine is running.
17. Never hold the material with the saw in the horizontal position. Always use the vise and clamp it securely.
18. Read and understand warnings posted on the machine.
19. Keep the belt guard and wheel covers in place and in working order.
20. Always provide adequate support for long and heavy material.
21. Use a sharp blade and keep machine clean for best and safest performance.
22. Failure to comply with all of these warnings may cause serious injury.

ELECTRICAL CONNECTION/DISCONNECTION.

FOR 3 PHASE

1. Electrical connection:

- a. A cable with four wires is equipped to connect your machine into the 3 phase power supply. Please connect your machine into the power supply with hand-operated disconnecting device, which is in compliance with subclause 5.3 of EN 60204, such as no fuse breaker or plug/socket combination.
- b. For the protection of control device, we recommend the operator to supply a fuse with appropriate current rating, and the total length between fuse and connection terminal shall not exceed 1.5 m.
- c. The power supply system is TN system.
- d. The exact power source voltage, frequency, and number of phase shall be checked according to the installation diagram and circuit diagram.
- e. The correct direction of saw blade should be checked after connecting.

2. Electrical disconnection:

- a. The disconnection is carried out by hand-operated disconnecting device, which is on the door of control box as an option or connected before the power source.
- b. Be sure to disconnect this machine from power source, when you want to stop the job, maintenance, and adjustment.

3. Grounding:

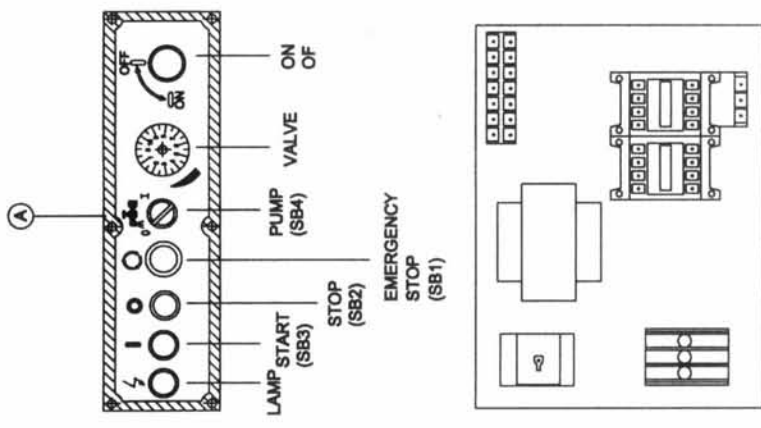
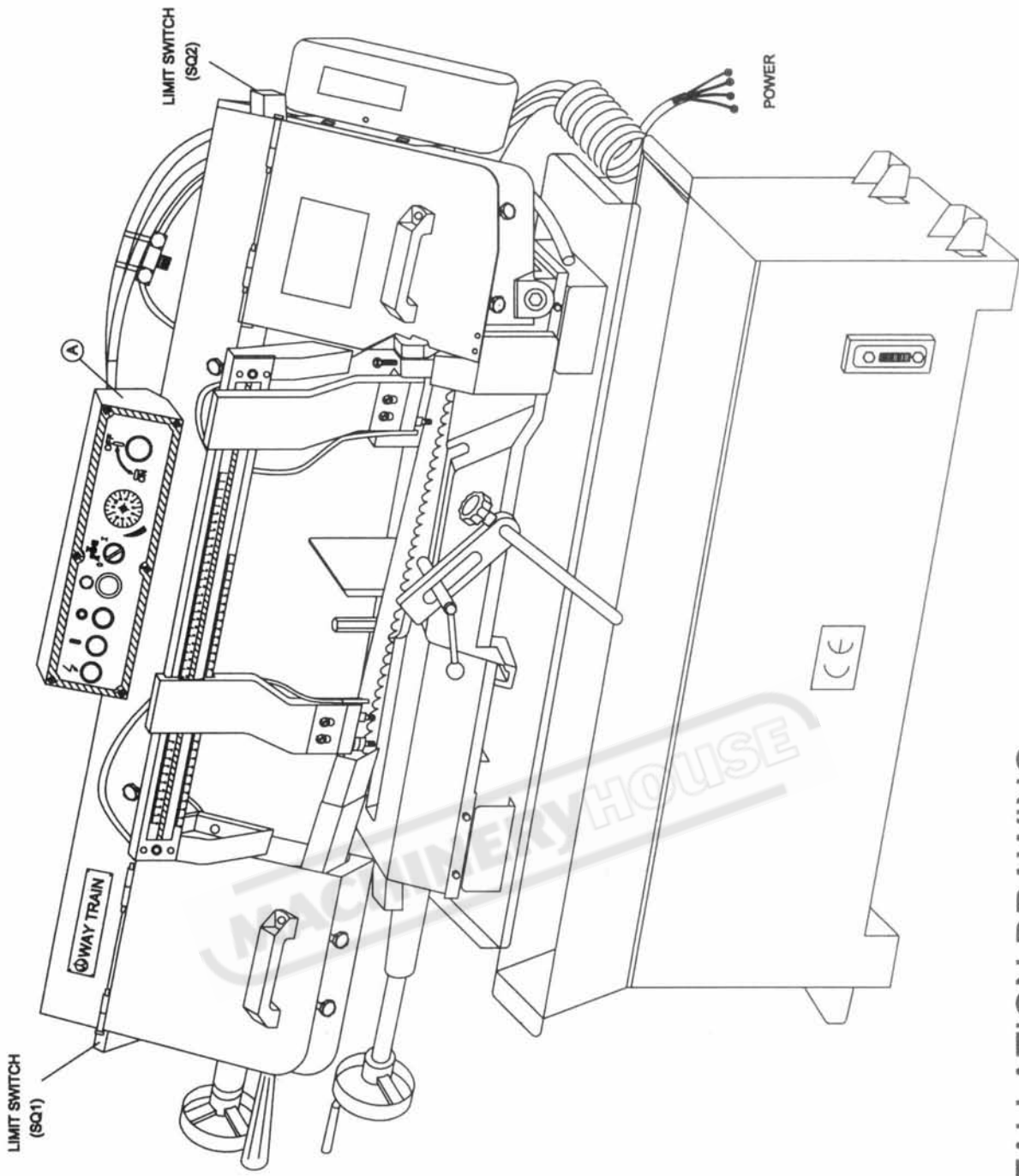
The grounding of this model is carried out by connecting the yellow/green terminal of supply cable to the grounding terminal of power source. Be sure to ground your machine before connecting machine to power source in any situation.

WARNING !

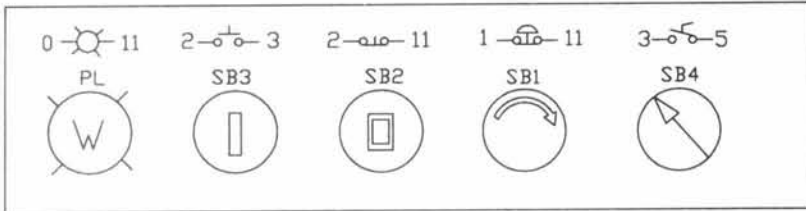
Do not disconnect grounding terminal before disconnecting power source.

FOR SINGLE PHASE

1. If the power cable is not equipped with plug, please connect and disconnect your machine with power according to the same instruction of three phase. Otherwise, please follow the following instruction (2~4).
2. The connection, disconnection, and grounding is carried out through the plug, equipped on the machine. For the safety reason, Do not change this plug into any other type in any situation.
3. For the protection of control device, we recommend the operator to supply a fuse with appropriate current rating, and the total length between fuse and connection terminal shall not exceed 1.5m.
4. The exact power source voltage, frequency, and number of phase shall be checked according to the installation diagram and circuit diagram.

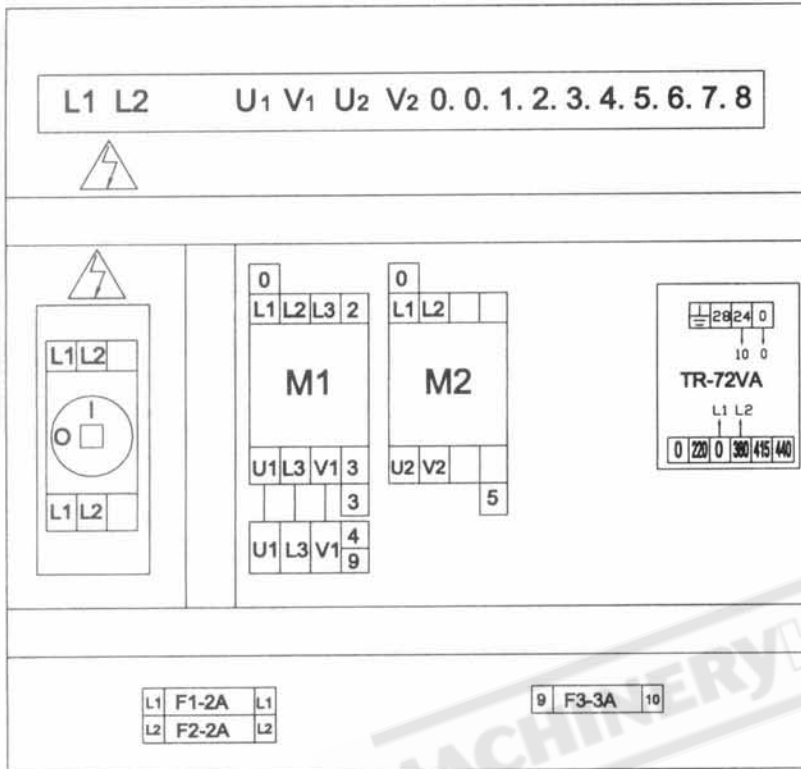


INSTALLATION DRAWING



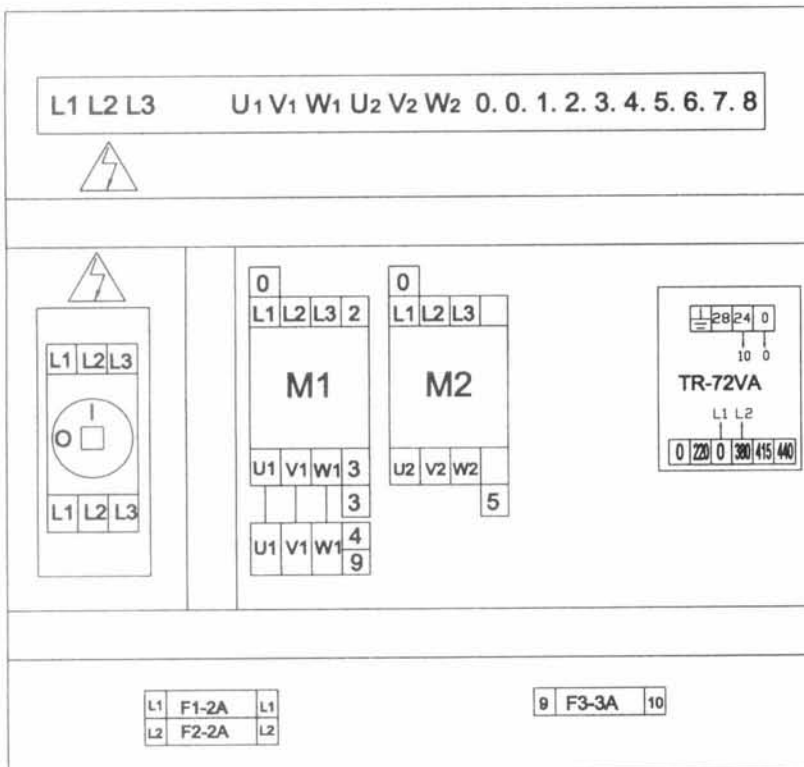
Electrical Schematic-Controls

1 Phase 220V/230V/240V



Electrical Panel Layout-Single Phase

3 Phase 220V/380V/400V/415V/440V



Electrical Panel Layout-Three Phase

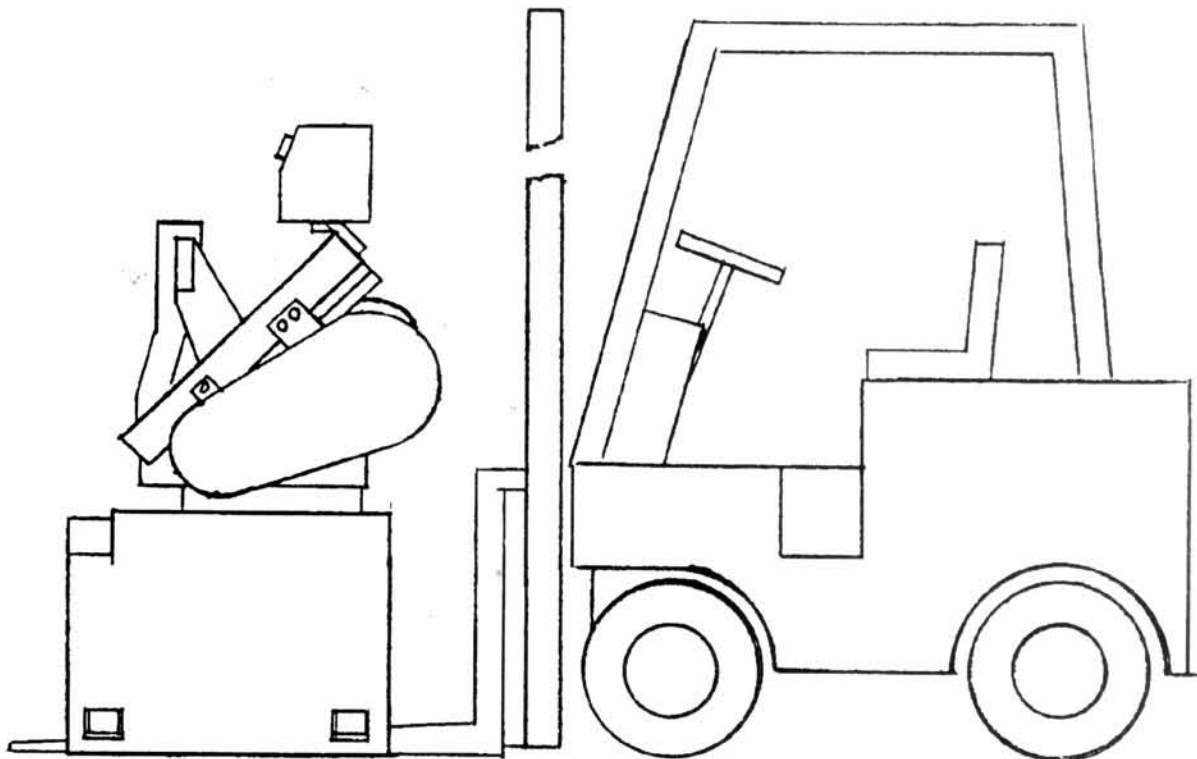
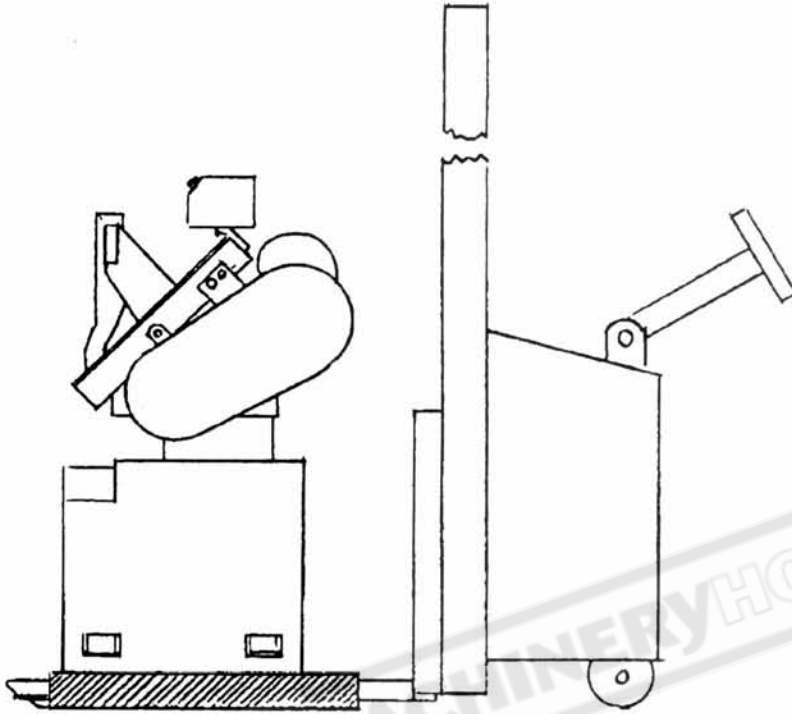
Schedule of Electrical Components

Item designation	Description and function	Technical data	Quantity	Remarks
QS	MAIN POWER SWITCH	AC 21 32 A 500 V	1	VDE 0660 IEC 408 BS 5419
FU1 FU2	AC FUSE TO TRANSFORMER	AC 600V 30 mm 2A	1 1	UL 198 G CSA C22.2 NO. 59.2
FU3	AC LOW VOLTAGE TO TRANSFORMER	AC 600V 30 mm 3A	1	
KM1 KM2	CONTACTORS	SPLA Ri=660 V Rt=25 A AC 3 220 V 2.2 Kw 380 V 4.0 Kw	1 1	IEC 158-1 BS 5424-1 VDE 0660 JIS 8325
FR	OVERLOAD RELAY	2.8-4.2 3-5 A Ui=600 V Ith=10 A	1	
TC	TRANSFORMER	AC 0-220-380 V 24V 72VA	1	IEC 76-5 EN 60742 IP 2X
SQ1 SQ2	SAFE-DOOR LIMIT SWITCH	AC 500V 5A	1 1	IEC 947 EN 60947 IP 65
SQ3	CUT-LIMIT SWITCH	AC 600V 10A 125, 250V 0.1A 600VDC	1	
SB1	EMERGENCY STOP	AC 600V 10A	1	
SB2 SB3	STOP-OFF START-ON	1 NO+1 NC AC 250V 10A 380V 7.5A	1 1	IEC 144 IP 65
SB4	PUMP-(0-1)		1	
TB	CASSET TERMINAL BLOCK	AC 600V 15 A	19	UL 9987 IP 2X
PL	DIRECT SUPPLY	22 AC 24V 1.2W	1	IEC 144 IP 65

Transportation Methods

WARNING







1. Always keep balance of the machine in transportation. Watch the gravity !
2. Drive folk lift slowly and carefully.



Operating Instructions

1. Check Coolant: Low coolant level causes foaming and high blade temperatures. Dirty or weak coolant can clog pump, causes crooked cuts, low cutting rate and permanent blade failure. Dirty coolant causes the growth of bacteria with ensuing skin irritation.
2. Keep vise slides clean and oiled.
3. Clean chips from blade wheels and wheels housing.
4. Saw Guide: Keep saw guides properly adjusted. Loose guides will affect cutting accuracy.
5. Saw Blade: Make sure the saw blade is sharp.
6. Blade Speed: Make sure the blade speed sets correctly for workpiece material and shaped.
7. Check Blade Tension: Particularly after initial cuts with a new blade.

THE SELECTION OF SAWBLADES

Cutting Material						
	<3mm	>5mm	>50mm	>100mm	>150mm	>200mm
Sawblade	<0.12"	>0.2"	>2"	>4"	>6"	>8"
(HSS) 14T	●					
(HSS) 6/10T		●				
(HSS) 5/8T			●			
(HSS) 4/6T			●	●		
(HSS) 3/4T				●		
(HSS) 2/3T					●	●
(HSS) 1/2T						●
(HCS) 10T	●					
(HCS) 8T		●				
(HCS) 6T			●			
(HCS) 4T				●		
(HCS) 2T					●	●

Remarks: HSS-High Speed Steel Sawblade
HCS-High Carbon Steel Sawblade

Blade Selection

- A. Never use a blade so coarse that less than 3 teeth are engaged in the workpiece at any time. (Too few teeth will cause teeth to strip out.)
- B. Never use a blade finer than required to obtain a satisfactory surface finish or satisfactory flatness. (Too many teeth engaged in the workpiece will prevent attainment of a satisfactory sawing rate; frequently cause premature blade wear; frequently produce "dished" cuts or the cuts are neither square nor parallel.)
- C. The chart which follows is not expected to be exactly correct for all cases. It is intended as a general guide to good sawing practices. Your blade supplier or the qualified engineers should be your most reliable source of correct information for operational details of saw blades and their use.

NOTE:

1. When cutting standard wall pipe, tubes, channel iron, angle iron, and I beam, a 10 pitch saw blade of wave-set type or sawblade of (HSS) 6/10T is frequently used for good advantage.
2. Tubes or structure with wall thickness or web thickness of 1/2" or more usually uses an 8 or 6 pitch blade or sawblade of (HSS) 4/6T satisfactorily.
3. When rectangular solid bar is to be sawed, the work should, whenever possible, be loaded with the thinnest cross section exposed to the blade teeth. The pitch (or number of teeth per inch of blade) selected must provide engagement of at least 3 teeth in the workpiece. Should application of this rule not be possible because the thinnest cross section is too thin, the piece must be loaded with the wider dimension exposed to the saw teeth and a coarser blade selected from the listing of recommendations for round and square solid bars.

Single Phase

Refer to the wire drawing inside the electrical box and above for proper motor and transformer connections, lead selection and wiring connections from the motor to the power source for the voltage you are using.

Three Phase

Refer to the wire drawing inside the electrical box and above for proper motor and transformer connections, lead selection and wiring connections from the motor to the power source for the voltage you are using. Important: Immediately after wiring the machine, remove the drive belt, turn on the power and make sure the motor is running in the right direction (clockwise when looking at the motor shaft.) If it is not, disconnect the machine from the power source and interchange any two lead lines.

General Operating Instructions

Removing and Installing the Blade

When your machine was shipped, a blade was supplied and assembled to the saw. When selecting a new blade refer to the selection of sawblades. The machine requires a blade 1" x 0.032" x 130". (27MM x 0.9MM x 3300MM)

1. Disconnect the machine from the power source.
2. Raise the saw frame about 6" and close the feed control valve by turning it clockwise as far as it will go. (Do Not Overtighten.)
3. Open both wheel covers and clean the chip out of the machine.
4. Release blade tension by turning the blade tension handwheel (C) Fig.1 counter-clockwise.
5. Slide left blade guide arm to the right as far as possible.
6. Remove the blade from both wheels and out of each blade guide.
7. Make sure the teeth of the new blade are pointing in the direction of travel. If necessary, turn the blade inside out.
8. Place the blade in place on the wheels (A) and through the upper blade guard. (B) Fig.1.

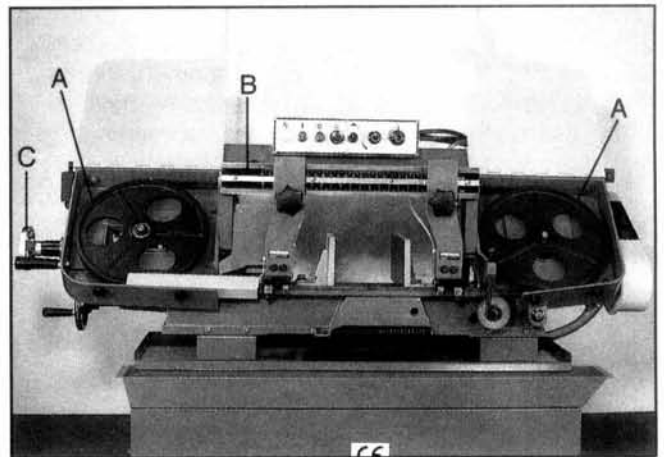


Fig. 1

9. Work the blade all the way up between the blade guide bearings with the back of the blade against the back-up bearing, as shown in Fig.2.

Note: If bearings need adjustment, refer to the section adjusting blade guide roller bearings.

10. Put light tension on the blade and work it on both wheels, as shown in Fig.3. Make sure that the back of the blade is against the wheel flanges of both wheels. This is very important.

11. When you are sure the back of the blade is against the wheel flanges of both wheels and properly inserted into the guides, finish putting tension on the blade.

Proper tension is achieved when the pointer is on the left mark of the blade tension scale behind the fly wheel.

12. Jog the power "on" and "off" to be sure the blade is in place and tracking properly. If blade is not tracking properly refer to the section tracking the blade.

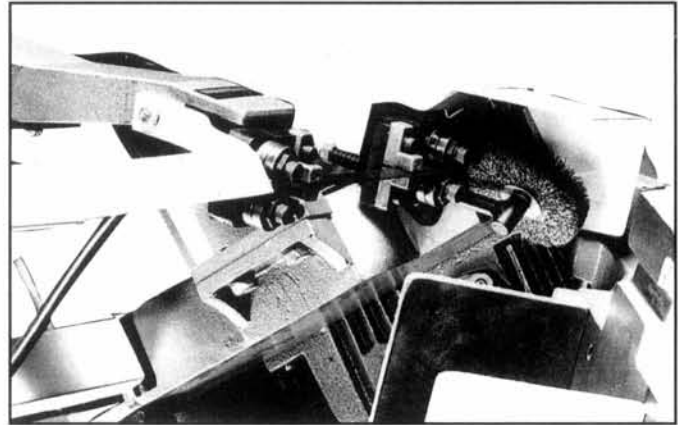


Fig. 2

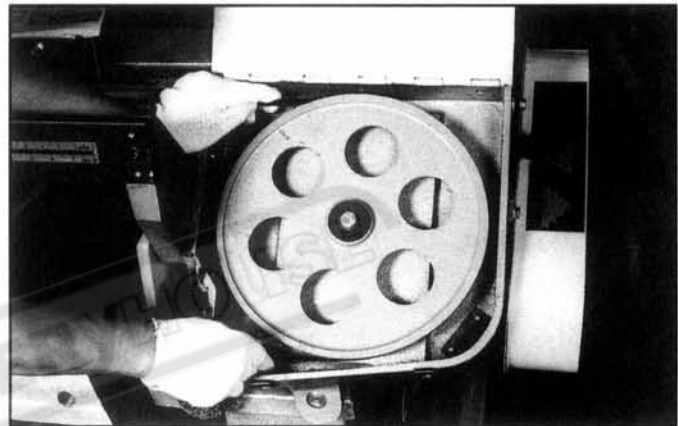


Fig. 3

Starting and Stopping the Machine

The saw frame must be in the raised position before starting the machine. The machine is started by pushing the start button (A) Fig.4, and will continue to run until the saw frame is in the down position at the end of the cut, or when the stop button (B) is pushed. Pushing the stop button (B) will stop the motor at any time.

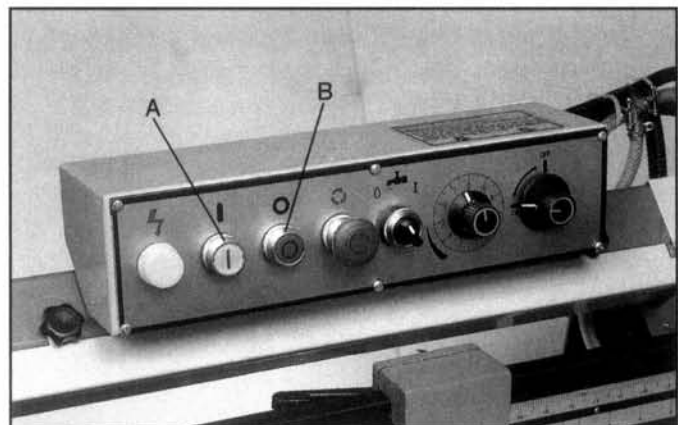


Fig. 4

Blade Tracking Adjustment

Blade tracking has been set at the factory and should require no adjustment. If a tracking problem occurs, adjust the machine as follows:

Since tracking can only be adjusted while machine is running, it is suggested that this adjustment be accomplished by qualified personnel that are familiar with this type of adjustment and the dangers associated with it.

1. Disconnect machine from the power source.
2. Raise saw arm to its highest position and close cutting pressure control valve to hold saw arm in place.
3. Locate tracking adjustment plate on the back side of the blade fly wheel.
4. Loosen the three bolts (A - Fig.5) located on the top of the tracking nuts.
5. Tracking adjustment is accomplished by either loosening or tightening three adjusting nuts (B - Fig.5).
6. Tracking is set properly when the back of the blade lightly touches the wheel flange. **Note:** over-tracking (allowing blade back to rub hard against wheel flange) will damage the blade wheels and blade.
7. Tighten locking bolts (A) once properly tracking is completed.
8. Connect machine to the power source.

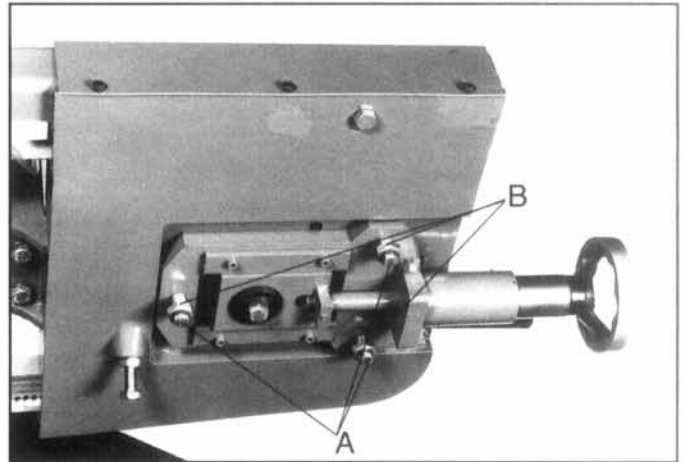


Fig. 5

Adjusting Feed Rate

When the oil regulating micro switch (A) Fig.6 is turned clockwise as far as it can go, the saw frame will not move down. By turning the feed control valve counter-clockwise, you regulate the flow of oil from the cylinder and determine the speed at which the saw frame will lower and the blade will feed through the work. Too many factors are involved to make tabulated data practical on feed rates. As a general rule, an even pressure without forcing the blade gives best results. Avoid forcing the blade at the start as this may shorten blade life and produce a bad cut. By inspecting the chip while the cut is being made will indicate whether the feed rate is correct. Fine powdery chip indicates a feed rate which is too light. The teeth are rubbing over the surface instead of cutting. Burned chip indicates excessive feed which causes the teeth to break off as the blade overheats. The ideal feed rate is indicated by chip that have a free curl and this will give the fastest cutting time and longest blade life.



Fig. 6

Adjusting Blade Guide Brackets

The blade guides should be set as close to the vise jaws as possible. The right blade guide bracket, is not adjustable and is set at the factory to clear the right hand vise jaw. The left blade guide bracket can be moved to the left or right depending on the size of the workpiece. To move the left blade guide bracket (A) Fig.7, loosen the knob (B), position blade guide bracket and tighten knob (B).

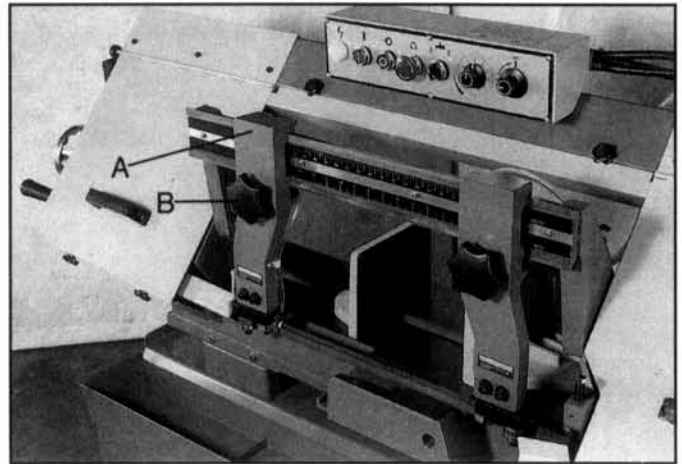


Fig. 7

Automatic Shut-Off Adjustment

The motor should shut off immediately after the blade has cut through the material and just before the head comes to rest on the horizontal stop bolt. If the machine continues to run after the workpiece has been fully cut, locate and adjust the micro switch mounting plate down. If the machine shuts off before the workpiece has been completely cut, move the micro switch mounting plate up.

Thrust Roller Adjustment

1. Disconnect machine from the power source.
2. Loosen two hex socket cap screws (A-Fig.8).
3. Move guide seat (B – Fig.8) up or down until a clearance of 0.003" to 0.005" between back of blade and thrust roller is obtained.
4. Tighten two hex socket cap screws (A – Fig.8).
5. Repeat for other blade guide assembly.
6. Connect machine to power source.

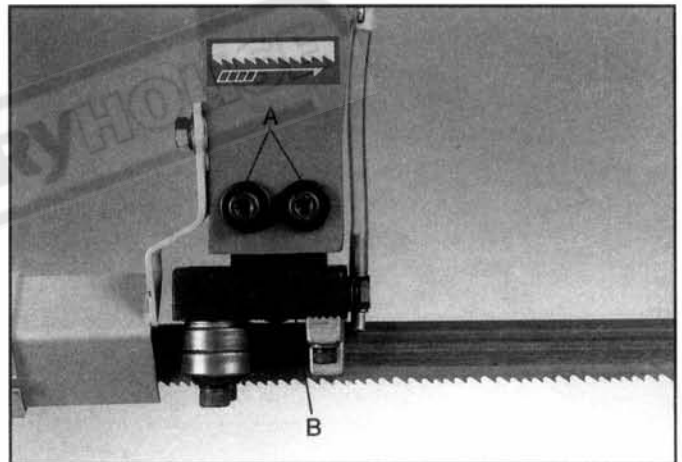


Fig. 8

Guide Roller Adjustment

1. Disconnect machine from the power source.
2. Loosen blade guides (A – Fig.9) by loosening screws (B). Slide blade guides away from blade.
3. Loosen locking screws (C) by using a hex wrench.
4. Adjust the eccentric bushings with a combination wrench until the ball bearings are snug to the blade. Note: blade should travel freely up and down between the ball bearings. Do not pinch the blade.
5. Tighten locking screws (C).
6. Slide blade guides back into contact with blade and tighten screws (B).
7. Connect machine to the power source.

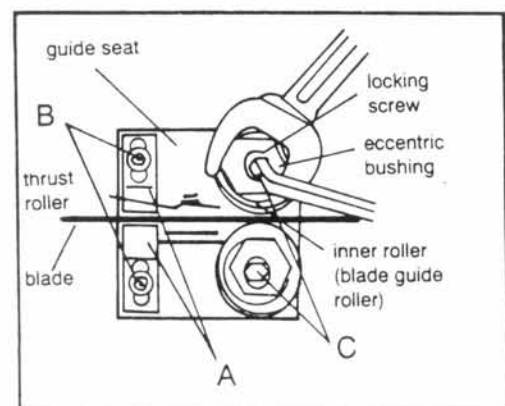


Fig. 9

Vise Adjustment

To position the moveable vise jaw:

1. Turn vise handwheel (A – Fig.10) 1/2 turn counter-clockwise.
2. Move rack block (B – Fig.10) to desired location by sliding along the bed. Place the rack block onto the rack.
3. Turn the handwheel to tighten the vise.

To adjust the vise for angle cutting:

1. Loosen bolts and move vise jaw (C – Fig.10) to desired location.
2. Set the vise to desired angle, reinstall nuts and tighten the nut and bolt assemblies.
3. Make sure the movable vise jaw parallels to the fixed vise jaw. Loosen the bolt (D – Fig.10) and adjust it until it is in parallel with the fixed vise jaw and tighten the bolt.

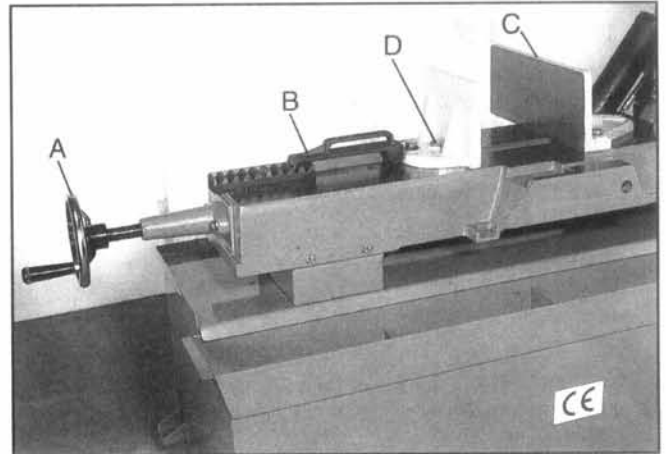


Fig. 10

Setting Up the Machine for Operation

1. Select the proper speed and blade for the type of material you are going to cut.
2. Make sure blade tension is adjusted properly.
3. Lift the saw frame up and turn off the oil regulating micro switch.
4. Place the stock between the vise jaws, set the stock for the desired length of cut and tighten the vise.
5. Make sure the left blade guide bracket (A) is adjusted as close as possible to the left vise jaw (B) Fig.11.
6. Turn the oil regulating micro switch (C) Fig.11, counter-clockwise until the saw blade begins to lower by the desired rate.
7. Proceed to cut through the workpiece, as shown in Fig.11. The machine will shut off upon completion of cut.

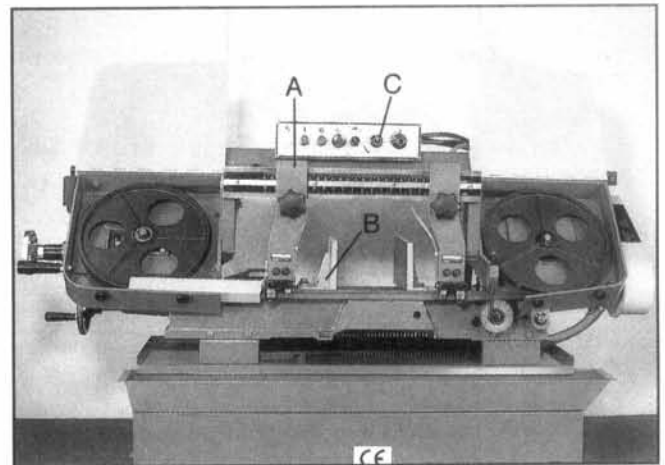


Fig. 11

Changing Speeds

For 250A

Your machine is provided with four speeds. To change speeds, proceed as follows:

1. Disconnect the machine from the power source.
2. Loosen wing nut (A), Fig.12 and lift up and swing belt and pulley guard (B) to the side of the machine.
3. Release tension on the belt by turning the tension lock knob counter-clockwise and letting the motor swing forward.
4. Shift the belt Fig.12, to the desired grooves on the pulleys and adjust belt tension by pulling the motor plate back until correct belt tension is obtained and tighten tension lock knob.
5. Close belt and pulley guard.

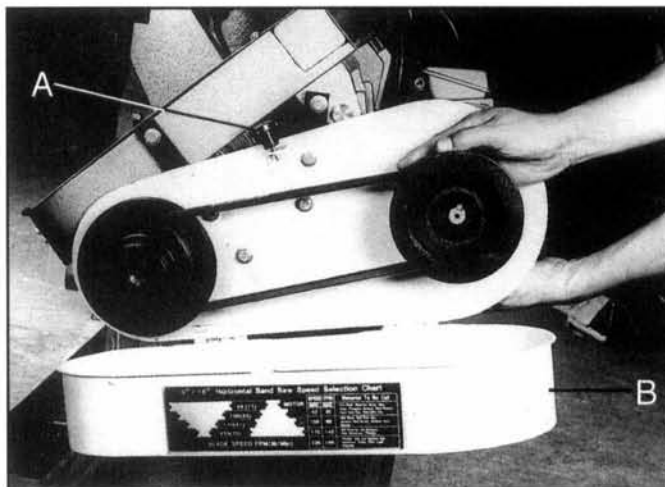


Fig. 12

For 250V

Your machine is provided with variable speed equipment, the ranges are 67-212FPM for 50HZ and 82-259 for 60HZ.

1. While your machine is running, speed can be adjusted.
2. Turn handle knob (A) Fig.13 clockwise to increase the speed.
3. Turn hand knob counter-clockwise to decrease the speed.

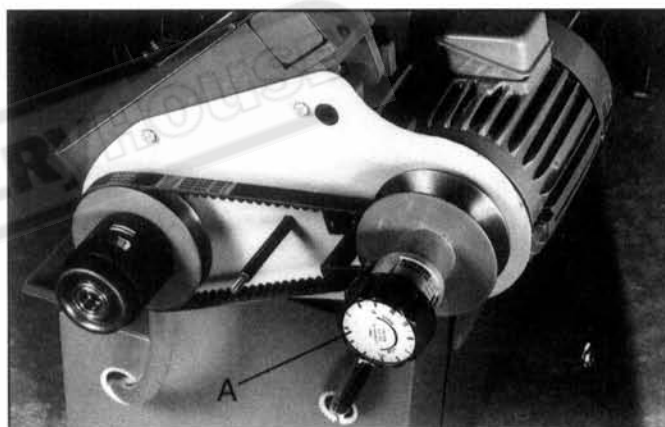


Fig. 13

Gear Case

After the first 50 hours of use the gear box should be drained and refilled. Remove drain plug Fig.14, drain all of the oil out of the gear box and replace plug. Remove oil filler plug located underneath the right blade wheel and fill the gear box with 1½ pints of MOBIL CYL. OIL # 600W or equivalent.

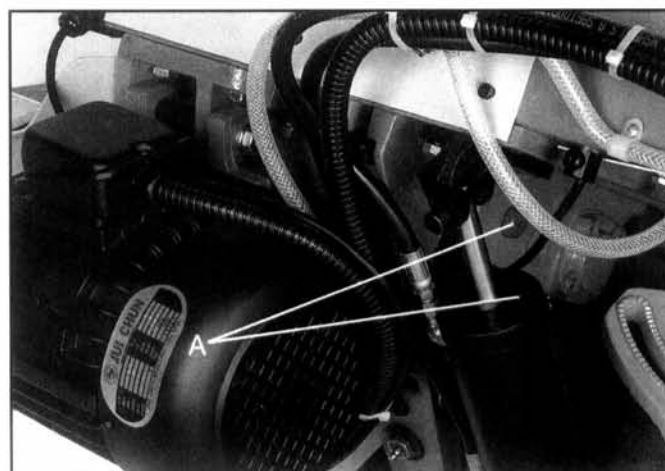
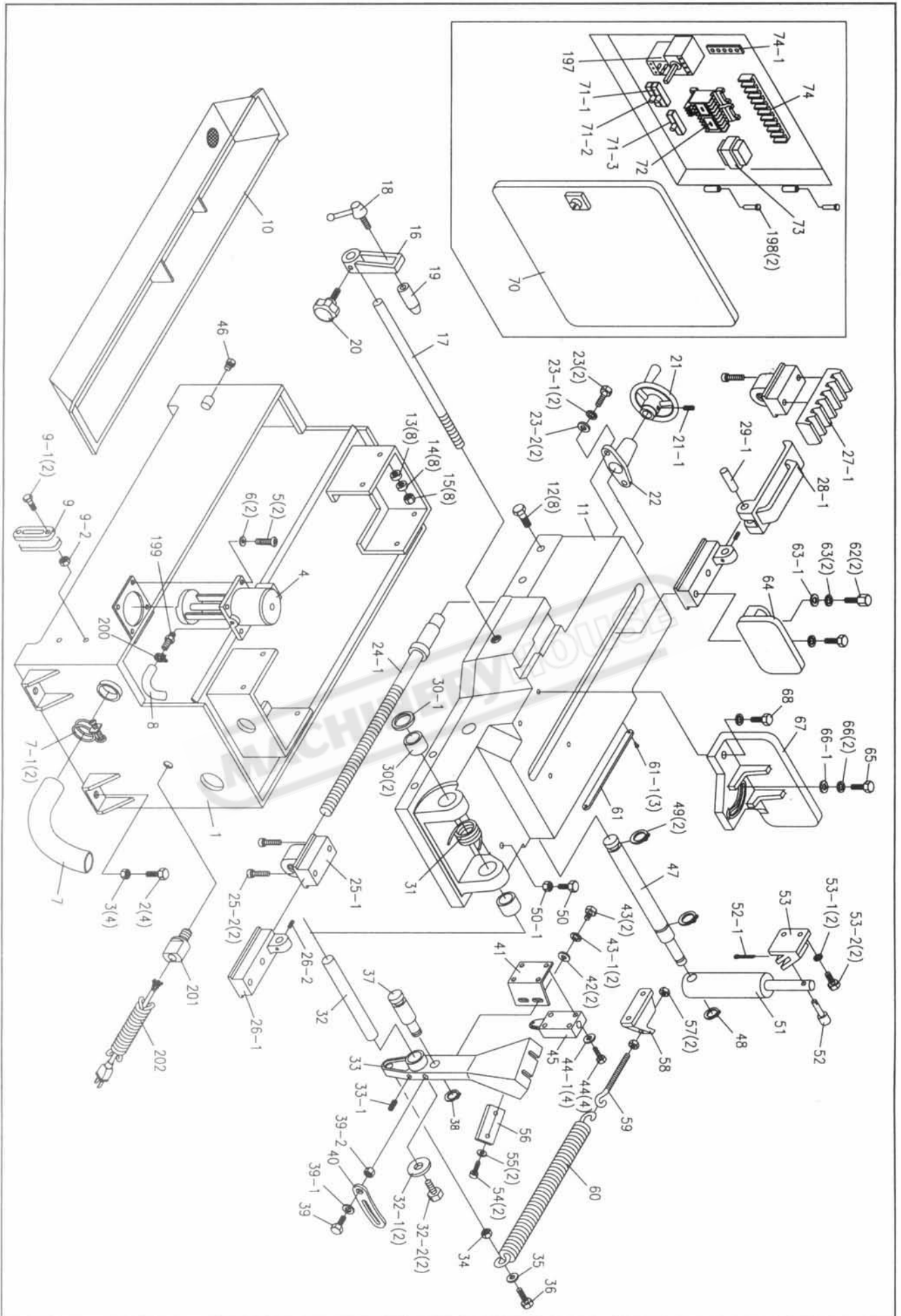


Fig. 14



PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
1	Base		1	36	Hex. Cap Bolt	M12x40	1
2	Hex. Cap Bolt	M12x65	4	37	Torsion Spring Shaft		1
3	Nut	M12	4	38	C-Ring	S-22	1
4	Coolant Pump		1	39	Hex. Cap Bolt	M8x30	1
5	Round Head Screw	M6x16	2	39-1	Washer	M8	1
6	Lock Washer	M6	2	39-2	Nut	M8	1
7	Hose		1	40	Motor Tilt Plate		1
7-1	Hose Clamp	35MM	2	41	Limit Switch Plate		1
8	Hose		1	42	Washer	M8	2
9	Coolant Gauge		1	43	Hex. Cap Bolt	M8x20	2
9-1	Hex. Cap Bolt	M10x30	2	43-1	Lock Washer	M8	2
9-2	Nut	M10	1	44	Hex. Cap Bolt	M6x12	4
10	Chip Tray		1	44-1	Washer	M6	4
11	Bed		1	45	Limit Switch		1
12	Hex. Cap Bolt	M8x30	8	46	Drain Plug	3/8PT	1
13	Washer	M8	8	47	Cylinder Pin		1
14	Lock Washer	M8	8	48	C-Ring	S-20	1
15	Nut	M8	8	49	C-Ring	S-25	2
16	Work Stop Bracket		1	50	Hex. Cap Bolt	M10x30	1
17	Work Stop Rod		1	50-1	Nut	M10	1
18	Lock Handle		1	51	Hydraulic Cylinder Assembly		1
19	Work Stop		1	52	Cylinder Pin-Top		1
20	Lock Knob	3/8" x1 1/4	1	52-1	Pin		1
21	Hand Wheel Assembly		1	53	Hydraulic Mounting Plate-Top		1
21-1	Set Screw	5/16"x3/8	1	53-1	Lock Washer	M10	2
22	Lead Screw Seat		1	53-2	Hex. Cap Bolt	M10x30	2
23	Hex. Cap Bolt	M8x30	2	54	Hex. Cap Bolt	M12x50	2
23-1	Lock Washer	M8	2	55	Washer	M12	2
23-2	Washer	M8	2	56	Lock Plate		1
24-1	Lead Screw		1	57	Nut	1/2"	2
25-1	Lead Screw Bracket		1	58	Spring Bracket		1
25-2	Hex. Socket Cap Screw	M8x25	2	59	Spring Adjustable Rod	1/2"	1
26-1	Slide Bracket		1	60	Spring		1
26-2	Set Screw	M6x8	1	61	Angle Scale		1
27-1	Rack		1	61-1	Rivet		3
28-1	Rack Block		1	62	Hex. Cap Bolt	M12x40	2
29-1	Pin		1	63	Lock Washer	M12	2
30	Closed Bearing	HK25 15	2	63-1	Washer	M12	1
30-1	Bushing		1	64	Vise Jaw-Left		1
31	Torsion Spring		1	65	Hex. Cap Bolt	M12x50	1
32	Pivot Shaft		1	66	Lock Washer	M12	2
32-1	Spacer	M12	2	66-1	Washer	M12	1
32-2	Hex. Cap Bolt	M12x20	2	67	Vise Jaw-Right		1
33	Pivot Bracket		1	68	Hex. Cap Bolt	M12x40	1
33-1	Set Screw	M10x12	1	70	Electrical Panel Cover		1
34	Nut	M12	1	71-1	Fuse	2A	1
35	Washer	M12	1	71-2	Fuse	2A	1

PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
71-3	Fuse	3A	1	106-1	Lock Washer	M12	6
72	Magnetic Switch		1	106-2	Nut	M12	6
73	Transformer		1	107	Locking Handle		1
74	Terminal Strip		1	108	Washer	M8	1
74-1	Grounding Plate		1	108-1	Lock Washer	M8	1
75	Handle		2	109	Hex. Cap Bolt	M8x45	4
76	Round Head Screw	M6x16	4	109-1	Washer	M8	4
77	Hex. Cap Bolt	M6x12	2	110	Motor Mount Plate		1
77-1	Lock Washer	M6	2	111	Motor		1
77-2	Washer	M6	2	112	Washer	M8	4
78	Wire Brush Guard		1	112-1	Lock Washer	M8	4
79	Hex. Socket Cap Screw	M6x8	12	113	Nut	M8	4
80	Blade Wheel Cover-Right		1	114	Key	7MM	1
81	Washer	M6	4	116	Hex. Socket Cap Screw	M8x20	2
82	Bushing		1	117	Blade Wheel Cover-Left		1
83	Washer		1	118	Ball Bearing		2
84	Drive Wheel		1	118-1	Lock Washer	M8	2
85	Blade		1	119	Hex. Cap Bolt	M12x20	2
86	Hose		1	120	Washer	M12	1
87	Round Head Screw	M5x10	2	121	Ball Bearing		3
88	Filter Screen		1	122	Idler Wheel		1
89	Hex. Cap Bolt	M12x35	4	123	Blade Guard		1
89-1	Lock Washer	M12	4	123-1	Washer	M8	2
90	Lock Knob		4	123-2	Lock Washer	M8	1
92	Blade Wheel Box-Right		1	123-3	Hex. Cap Bolt	M8x16	1
93	Connector		1	124	Guide Bracket-Left		1
94	Gear Box Assembly		1	124-1	Set Screw	M8x16	6
94-1	Key	8MM	1	125	Washer	M8	4
95	Key	7MM	1	126	Ball Bearing	6201ZZ	8
96	Pulley Cover		1	127	Centric Sleeve		2
96-1	Lock Knob	1/4"	1	127-1	Eccentric Sleeve		2
97	Gear Box Pulley		1	128	Lock Washer	M8	4
98	Belt	A.39	1	129	Hex. Socket Cap Screw	M8x45	4
99	Motor Pulley		1	130	Hex. Socket Cap Screw	M6x30	4
99-1	Set Screw	M8x10	2	130-1	Washer	M6	8
100	Hex. Cap Bolt	M8x16	2	131	Tungsten Carbide Blade Guide		4
100-1	Washer	M8	2	132	Hex. Cap Bolt	M8x40	4
100-2	Lock Washer	M8	2	133	Lock Washer	M8	4
101	Hose		1	133-1	Washer	M8	4
101-1	Hose		1	134	Adjustable Bracket-Left		1
102	Support Shaft		1	135	Scale		1
102-1	Washer	M12	1	135-1	Round Head Screw		4
102-2	Nut	M12	1	136	Hex. Socket Cap Screw	M10x25	2
103	Hex. Cap Bolt	M12x35	2	137	Slide		1
104	Motor Mount Bracket		1	138	Blade Bracket-Left		1
105	Column		1	139	Hex. Cap Bolt	M12x30	4
106	Hex. Socket Cap Screw	M12x20	6	139-1	Lock Washer	M12	4

PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
139-2	Washer	M12	2	184	Thrust Bearing		1
141	Knob		2	187	Slide		1
143	Set Screw	M8x10	4	188	Set Screw	M8x10	1
144	Blade Bracket-Right		1	189	Extension Bar		1
145	Hex. Cap Bolt	M6x12	1	190	Blade Wheel Shaft		1
146	Washer	M6	1	191	Nut	M12	1
147	Wire Brush		1	191-1	Set Screw	M6x8	1
148	Wire Brush Rod		1	192	Hex. Socket Cap Screw	M8x25	4
149	Guide Bracket-Right		1	193	Hex. Cap Bolt	M12x20	1
150	Spring		1	193-1	Washer	M12	1
152	Nut	M10	1	194	Gib		2
154	Adjustable Bracket-Right		1	195	Hex. Cap Bolt	M16x30	3
155	Nut	M12	1	196	Hex. Cap Bolt	M10x60	3
156	Stand Bolt	M12x50	1	196-1	Lock Washer	M10	3
157	Blade Guard		1	197	General Switch		1
157-1	Blade Guard-Down		1	198	Pin		2
158	Lock Knob		2	199	Hose Fitting		1
159	Set Screw	M6x8	1	200	Hose Clamp	14MM	1
160	Adjusting Valve		2	201	Strain Relief Fitting		1
160-1	Brace		2	202	Power Cord		1
160-2	Lock Washer	M6	4	203	Limit Switch		2
160-3	Hex. Cap Bolt	M6x12	4	204	Round Head Screw	5/32x32	4
161	Power Indicator Light		1	205	Limit Switch Guard		2
162	Start Switch		1	206	Round Head Screw	M5x8	4
163	Stop Switch		1	207	Hose		1
163-1	Emergency Stop Switch		1	208	Hose		1
164	Pump Switch		1	209	Speed Chart Label		1
165	Speed Control Valve		1	213	Washer	M10	2
166	Connection Tube		1	214	Clamp		2
166-1	Hose Clamp		5	215	Cu Connecting		2
168	Control Box		1	V95	Support Rack		1
169	Control Panel		1	V95-1	Hex. Cap Bolt	M6x12	2
169-1	Oil Regulating Micro Switch		1	V95-2	Lock Washer	M6	2
169-2	On/Off Switch		1	V95-3	Washer	M6	2
170	Round Head Screw	M5x10	6	V96	Pulley Cover Plate		1
171	Wheel Box-Left		1	V96-1	Hex. Cap Bolt	M8x16	3
172	Handle		1	V96-2	Lock Washer	M8	3
173	Nut	M12	2	V96-3	Washer	M8	6
175	Round Head Screw	M5x10	2	V97	Gear Box Pulley		1
176	Indicator Scale		1	V98	Belt		1
177	Slide Bracket		1	V99	Variable Speed Adjustable		1
178	Tension Shaft		1	V100	Pulley Cover		1
179	Key	5MM	1	V101	Support Shaft		1
180	Handwheel		1	V101-1	Knob	3/8"	1
181	Disc Spring		13	V101-2	Washer	M10	1
182	Flat Washer		1	V101-3	Nut	5/16"	1
183	Tension Indicator		1	V101-4	Lock Washer	M8	1