

SHARP

SW-100A

Instruction Manual

Version 1 20170831

Safety rules



- Make sure your work area is cleared of uninvited people and obstacles every time before you start operating the machine.



- Never step or stand on the roller table. Your foot may slip or trip on the rollers and you will fall.



- Never wear gloves or loose clothing when operating the machine. It may lead to serious injury if they are caught in the running machine. Wrap or cover long hair.



- Make sure any use of fire is prohibited in the shop and install a fire extinguisher or other fire control device near the machine when cutting titanium, magnesium, or any other material that produces flammable chips. Never leave the machine unattended when cutting flammable materials.



- Use a water-soluble cutting fluid on this machine. Oil-based cutting fluids may emit smoke or catch fire, depending on how they are used.



- Never cut carbon or any other material that may produce and disperse explosive dust. It is possible that sparks from motors and other machine parts will ignite and explode the air-borne dust.

Safety rules



- Never adjust the wire brush or remove chips while the saw blade is still running. It is extremely dangerous if hands or clothing are caught by the running blade.
- Stop the saw blade before you clean the machine. It is dangerous if hands or clothing are caught by the running blade.

- Never start the saw blade unless the workpiece has been clamped firmly. If the workpiece is not securely clamped, it will be forced out of the vise during cutting.



- Take preventive measures when cutting thin or short pieces from the work to keep them from falling. It is dangerous if the cut pieces fall.
- Use roller tables at the front and rear sides of the machine when cutting long work. It is dangerous if the work piece falls off the machine.



- Turn off the shop circuit breaker switch before performing maintenance on the machine. Post a sign indicating the machine is under maintenance.

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SAFETY

INFORMATION

- SAFETY INSTRUCTIONS
- SAFEGUARD DEVICES
- EMERGENCY STOP
- SAFETY LABELS
- HEARING PROTECTION
- CE COMPLIANCE
- RISK ASSESSMENT

Safety is a combination of a well-designed machine, operator's knowledge about the machine and alertness at all times. COSEN's band machine has incorporated many safety measures during the design process and used protective devices to prevent personal injuries and potential risks. Warning labels also serve as a reminder to the operator.

Throughout this manual, you will also see various safety-related symbols indicating important information that you should take note of prior to use of the machine or part of its functions. These important safety instructions do not cover all possible situations that might occur. It is your responsibility to take caution and follow procedures stated in this manual when installing, maintaining and operating your machine. Cosen will not be liable for damages resulting from improper use.

SAFETY INSTRUCTIONS

What the icons and signs in this user manual mean:



This icon marks **WARNING**; hazards or unsafe practices that may result in **personal injury or damage to the machine**.



Supplementary information to the procedures described in this manual.



Call your local agent or our service center for help.



This manual has important safety information. Read through it carefully before operating this machine to prevent personal injury or machine damage. Learn the operation, limitation and the specific potential hazards peculiar to this band saw. All users must read it before performing any activity on the machine, such as replacing the saw band or doing regular maintenance.



Do not operate this machine unless it is completely assembled.



Keep all guards and shields in place before installing or starting up the machine.



Keep blade protection cover and wheel covers in place and in working order.



Make sure the power switch is off before plugging in power cord.



Disconnect the power cord before making adjustment, maintenance or blade changes.



Always remember to switch off the machine when the work is completed.



Keep unauthorized personnel away.



Use recommended accessories.

Improper accessories may be hazardous.



Never hold the material by hand for cutting. Always use the vise and make sure the material is clamped securely before cutting.



When a workpiece is too long or heavy, make sure it is supported with a roller table (recommended).



Do not use the machine to cut explosive material or high pressure vessels as it will generate great amount of heat during the sawing process and may ignite an explosion.



Wear proper apparel during operation and when servicing the machine. Some personal protective equipment is required for the safe use of the machine, e.g. protection goggles.



Never operate while under the influence of drugs, alcohol or medication.



Do not reach over or stand on any part of the machine.



It is dangerous to operate the machine when the floor is slippery. Keep the floor clean and dry. Check for ice, moisture, or grease before entering.



Keep the work environment safe. Do not use band saw in a damp or wet location.



Keep your work area clean. Cluttered and slippery floors invite accidents.



Keep your work area well illuminated at minimum 500 lumen.



Remove adjusting keys, wrenches or any loose parts or items from the machine before turning on power.



Moving parts should be kept in proper alignment and connection with the machine. Check for breakage, mounting and any other conditions that may affect its operation. Any damaged part or guard should be properly repaired or replaced.



Use a sharp saw blade and keep the machine in its best and safest performance by following a periodical maintenance schedule.

SAFEGUARD DEVICES

The safeguard devices incorporated in this machine include the following two main parts:

1. Protection covers & guards
2. Safety-related switches

Protection Covers & Guards

1. Idle wheel housing cover
2. Drive wheel housing cover
3. Gear reducer cover
4. Wire brush belt cover
5. Blade guard cover (left & right)
6. Safety fence (left & right)(CE model only, as shown in Illustration: *Safety Fence*)
7. Chip conveyor cover (CE model only)



The protection devices should always be mounted on the machine whenever the machine is running.



Do not remove any of these safeguard devices under any circumstances except when servicing the machine. Even skilled service technicians should still take cautions when performing repairs or service on the machine with any of these protectors removed. It is the responsibility of the user to make sure all these elements are not lost and damaged.



Take note of the following main moving parts on the machine prior to and during machine operation:

- Saw bow assembly
- Drive and idle wheels
- Blade guide arm
- Saw blade guide rollers
- Quick approach device (optional)
- Wire brush
- Chip conveyor (optional)
- Workpiece clamping vises
- Shuttle vises and workbed rollers
- Top clamps (optional)
- Gear reducer

Safety Related Switches

To protect the operator, the following safety related switches on the machine are actuated when the machine is in operation.

Wheel motion detector	This is a proximity sensor used to detect the motion of the drive wheel. Once the saw blade is broken or as soon as it starts slipping , the sensor will detect and stop the drive wheel and the machine.
Power switch	Located on the cover of electrical cabinet, the power switch controls the main power of the machine. Up to your company's internal rules, this power switch can be locked with a padlock or a luggage lock to protect the operator and the machine.
Emergency stop button	Located on the control panel , the button when pressed will stop the machine completely.
Vise clamp switch	This switch assures firm clamping of the workpiece. If the workpiece is not clamped properly, the saw blade is not allowed to run.
Wheel cover interlock switches (CE model only)	Located on the two wheel housings, these switches are used to assure that the machine will stop whenever the wheel covers are open. This device is to protect users from being cut by the running saw blades.

Among all these safety switches, some of them are used to protect the users and some of them are used to prevent damage to saw blades, the workpiece and the machine itself, etc. We have taken every precaution to prevent injury or damage and to provide safe and economical operation of the machine.

EMERGENCY STOP

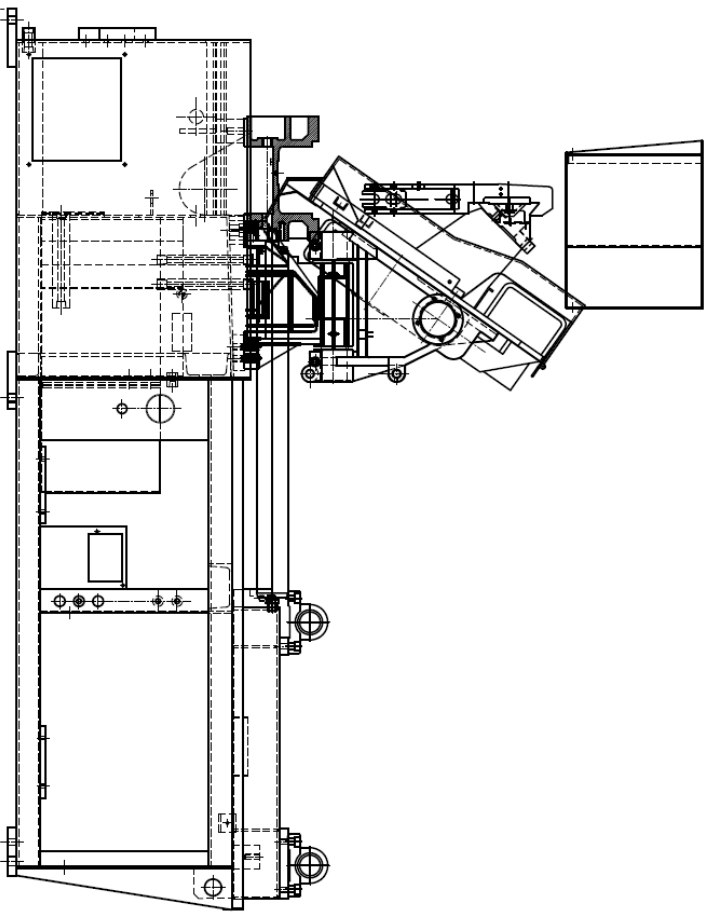
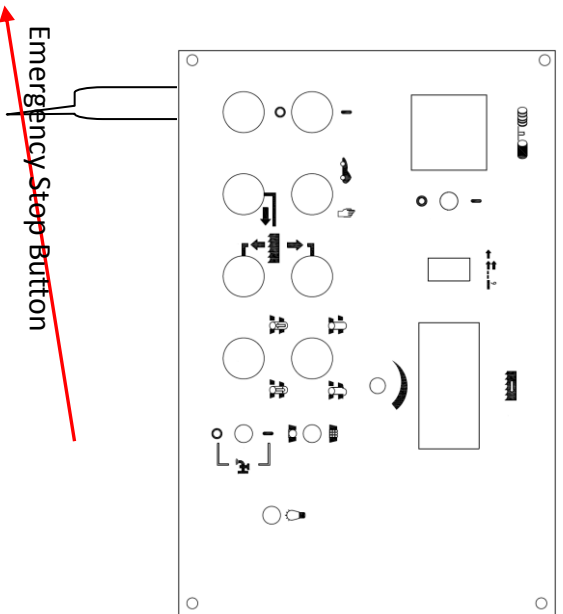
Designed to be easily accessible, the emergency stop button is located on the left bottom corner on the control panel and is made in red color and rubber material. **For CE models, supplementary emergency stop button may be available at other area(s) of the machine depending on machine type. Please refer to *Illustration: Emergency Stop*.**

When you press the button, the machine will immediately come to a full stop to avoid injury or damage when an accident occurs. The button will be locked when you press it. To unlock it, turn the button clockwise.

You should press it immediately without any hesitation when observing:

- An emergency situation that would cause any injury or damage
- An abnormal situation or problem such as fire, smoke, abnormal noise and etc.

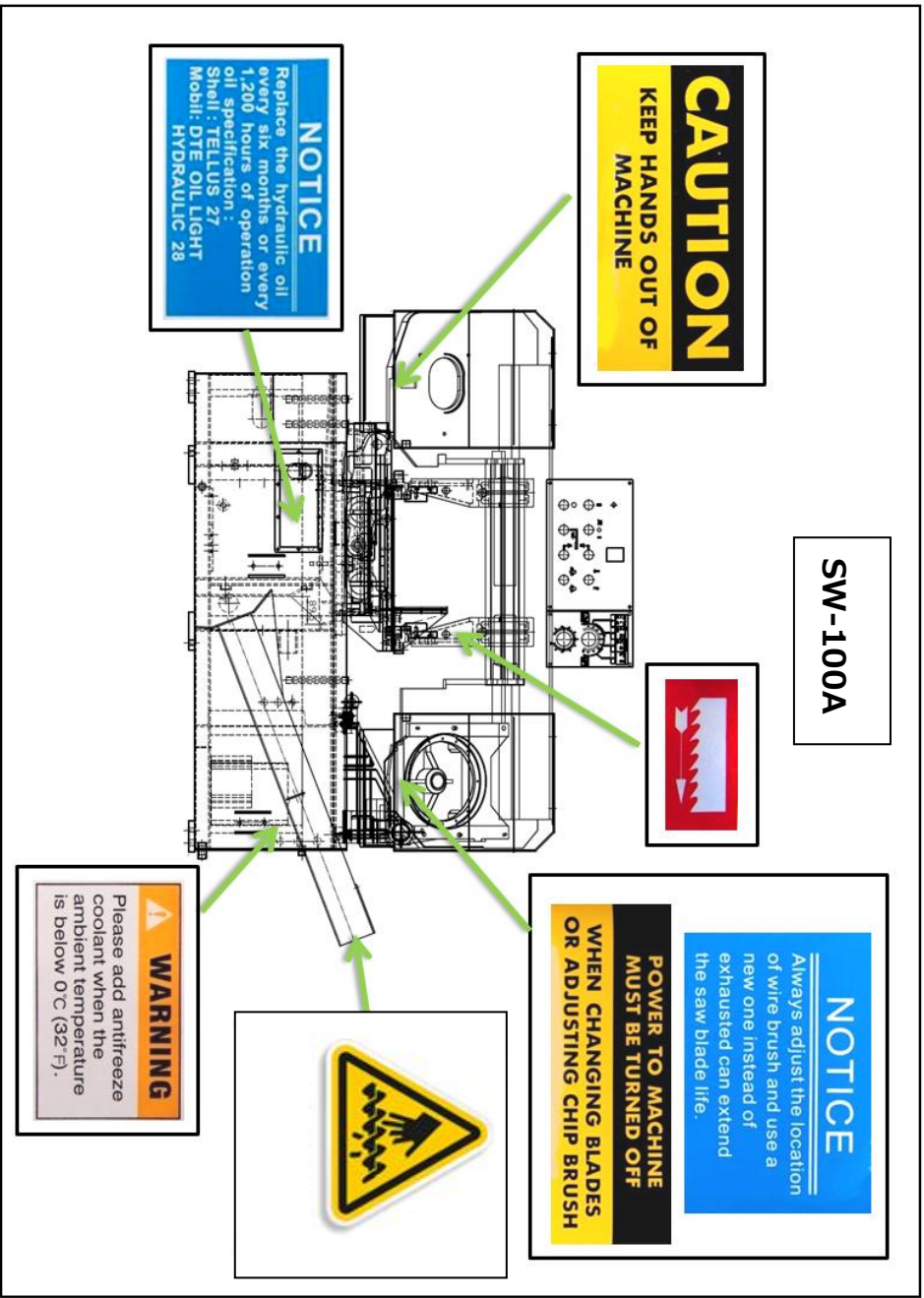
Illustration : Emergency Stop



SAFETY LABELS

Please read through and understand them before operating the machine. Refer to *Illustration: Safety Labels*.

Label	Meaning	Label	Meaning
	Impact Hazard WEAR SAFETY SHOES. Do not approach dropping area during operation.		Read Operator's Manual This manual has important safety information. Read through it carefully before operating this machine to prevent personal injury or machine damage.
	Keep Unauthorized Personnel Away		Do not step. Do not stand on the machine or on the accessories!
	DANGER: Running Blade Blade runs through this area. Keep your hands away from a running blade to avoid severe injury. The arrow indicates direction of the blade.		Cutting Hazard KEEP COVER CLOSED / KEEP HAND OFF while the blade is running. Turn power off before opening cover. Failure to follow the warning can result in severe injury.
	Hazardous Voltage TURN POWER OFF before servicing. Failure to following the warning can result in severe injury.		Burn Hazard/Hot Surface
	Hand Crush/Force from Above Crush hazard by vise		
	Loose Hand Hazard KEEP HAND OFF. Do not touch chip conveyor. Failure to follow the warning can result in severe injury.		Pinch Point/Hand Entanglement



HEARING PROTECTION



Always use ear protection!

When your machine is running, noise generated by the machine may come from the following:

- Saw blade during cutting or material feed mechanism
- Wire brush unit
- Chip conveyor unit
- Speed reducer
- Hydraulic motor/pump
- Belt transmissions variable speed motors
- Blade motor
- Coolant pump
- Drive wheel
- Parts not assembled tightly causing mechanical vibration

Our products pass noise testing less than 78 dBA. Noise level vary according to working conditions and we recommend ear plugs or other hearing protection at all time. If your machine produces an undesirable noise while it is running, you should:

1. Make sure all maintenance tasks have been performed following the prescribed maintenance schedule (Refer to Section 6).
2. If maintenance does not seem to solve the problem, follow the troubleshooting procedures under Section 7.

CE COMPLIANCE

Cosen's CE model is designed to satisfy regulations of the Council Directive on the approximation of the laws of the Member States relating to machinery (**2006/42/EC**) - Annex I Essential health and safety requirements relating to the design and construction of machinery.

RISK ASSESSMENT

Risk assessment generally takes account of intended use and foreseeable misuse, including process control and maintenance requirements. We made every effort to avoid any personal injury or equipment damage during the machine design stage. However, the operator (or other people) still needs to take precautions when handling any part of the machine that is unfamiliar and anywhere on the machine that has potential hazards (e.g. the electrical control box).

GENERAL INFORMATION

SPECIFICATION

MACHINE PARTS IDENTIFICATION

FLOOR PLAN

This band saw machine is designed by Cosen's R&D engineers to provide you the following features and advantages:

Safety

- This machine is designed to fully protect the operator from its moving parts during cutting operation.
- The machine and each component has passed strict testing (Council Directive on the approximation of the laws of the Member States relating to Machinery).
- The machine will shut off automatically when the saw blade is broken, protecting both the operator and the machine.

Convenience & High-Performance

- The machine is designed in the way that the operation and adjustment can be easily performed.
- The machine will stop automatically when out of stock.
- Dual valve system is designed to achieve optimal cutting performance with the simple setting of feed rate and perspective cutting pressure for different material.

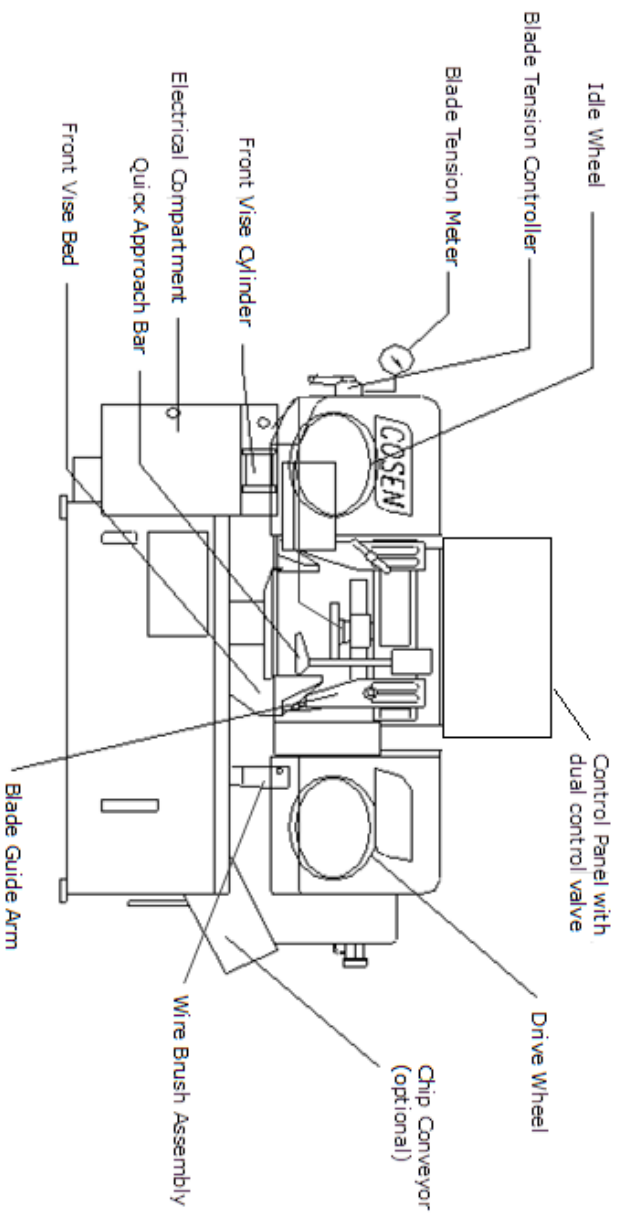
Durability

- The intended life-span of the machine is counted based on regular daily operation. It is calculated with the life expectancy of 10 years under normal operating condition and exact attention to the maintenance schedule.
8 hours × 5 days × 52 weeks × 10 years = 20,800 hours

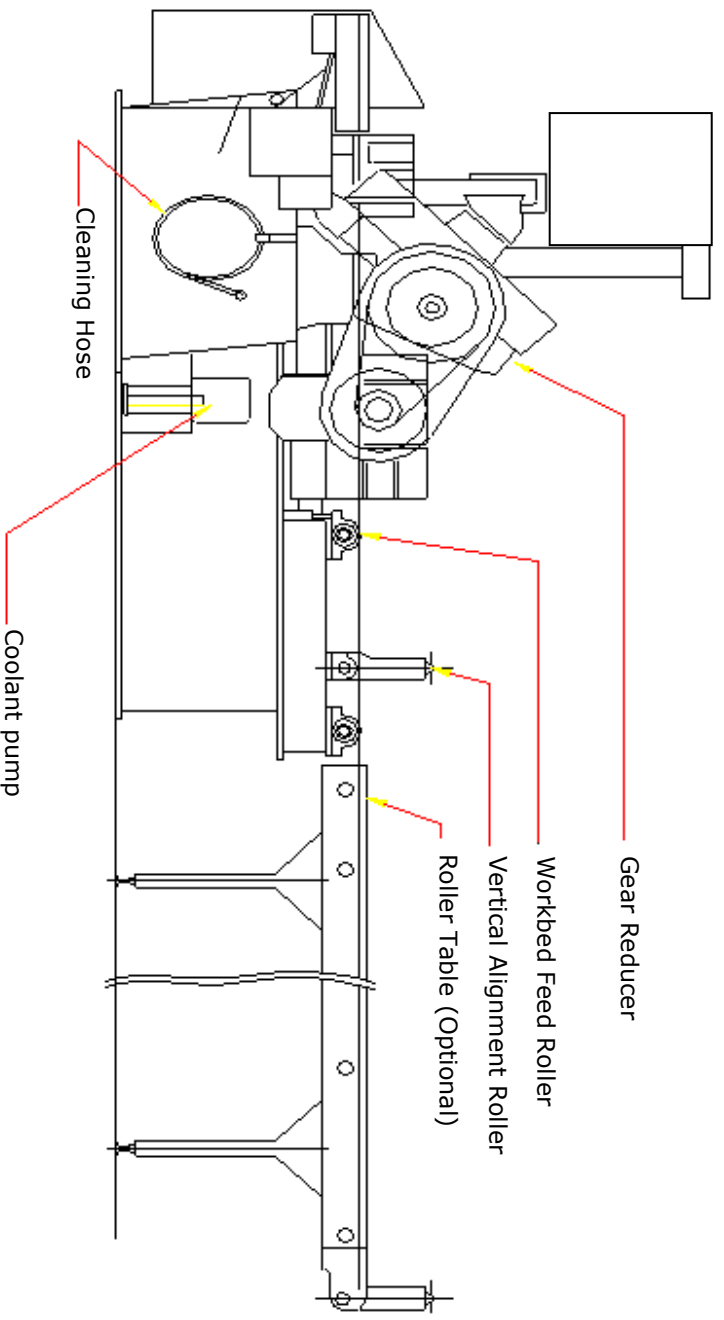
SPECIFICATION

Model	SW-100A Automatic Horizontal Bandsaw	
Capacity	●	250 mm (10")
	■(H x W) ■ (H x W)	250×250 mm (10"×10") 280×250 mm (11"×10")
Speed (50 Hz)		23, 34, 45, 57, 67 m/min. (23 ~ 67 m/min) 75, 112, 148, 187, 220 fpm. (75 ~ 220 fpm)
	Speed (60 Hz)	27, 40, 54, 68, 80 m/min. (27 ~ 80 m/min) 89, 131, 177, 223, 262 fpm. (89 ~ 262 fpm)
Saw Blade	Size	27×3505×0.9 mm 34×3505×0.9 mm (options)
	Tension	Hydraulic
Guide		Interchangeable tungsten carbide
	Cleaning	Steel wire brush with flexible drive shaft driven by main motor
Motor Output	Saw Blade	2.2 kW (3 HP)
	Hydraulic	0.75 kW (1 HP)
Tank Capacity	Coolant Pump	0.1 kW (1/8 HP)
	Hydraulic	20 L (5.0 gal.)
Feeding Length	Coolant	38 L (9.5 gal.)
	Mode	Hydraulic with full stroke cylinder
Workbed Height	Single Stroke	403 mm (15.9")
	Multi Stroke	Max. 3,600mm (141.7")
Weight	Net	1400 kgs (3080 lbs)
	Gross	1600 kgs (3520 lbs)
Floor Space (L x W x H)		2100×2150×1800 mm (74.5"×84.6"×58")
Operating Environment	Temperature	5~40°C (41~104°F)
	Humidity	30%~85% (without condensation)

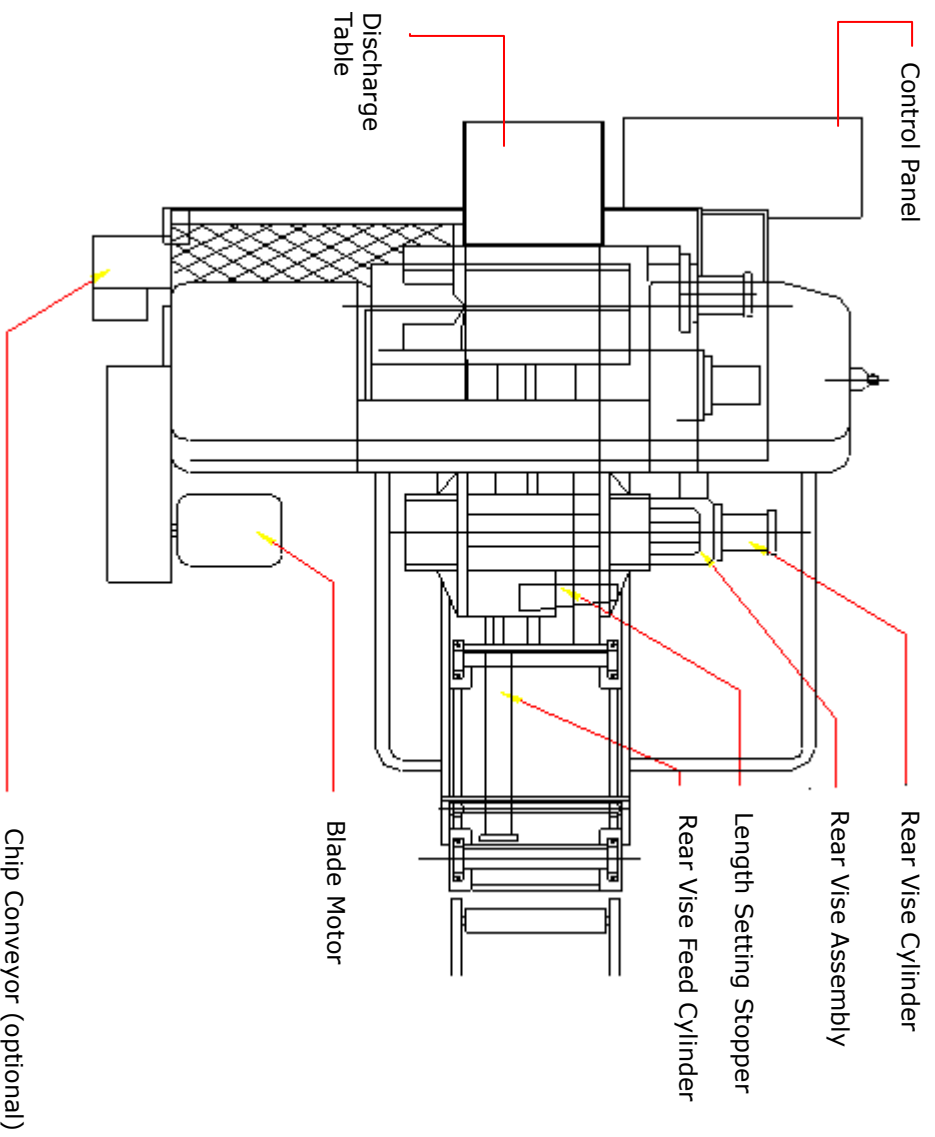
MACHINE PARTS IDENTIFICATION



Machine front view

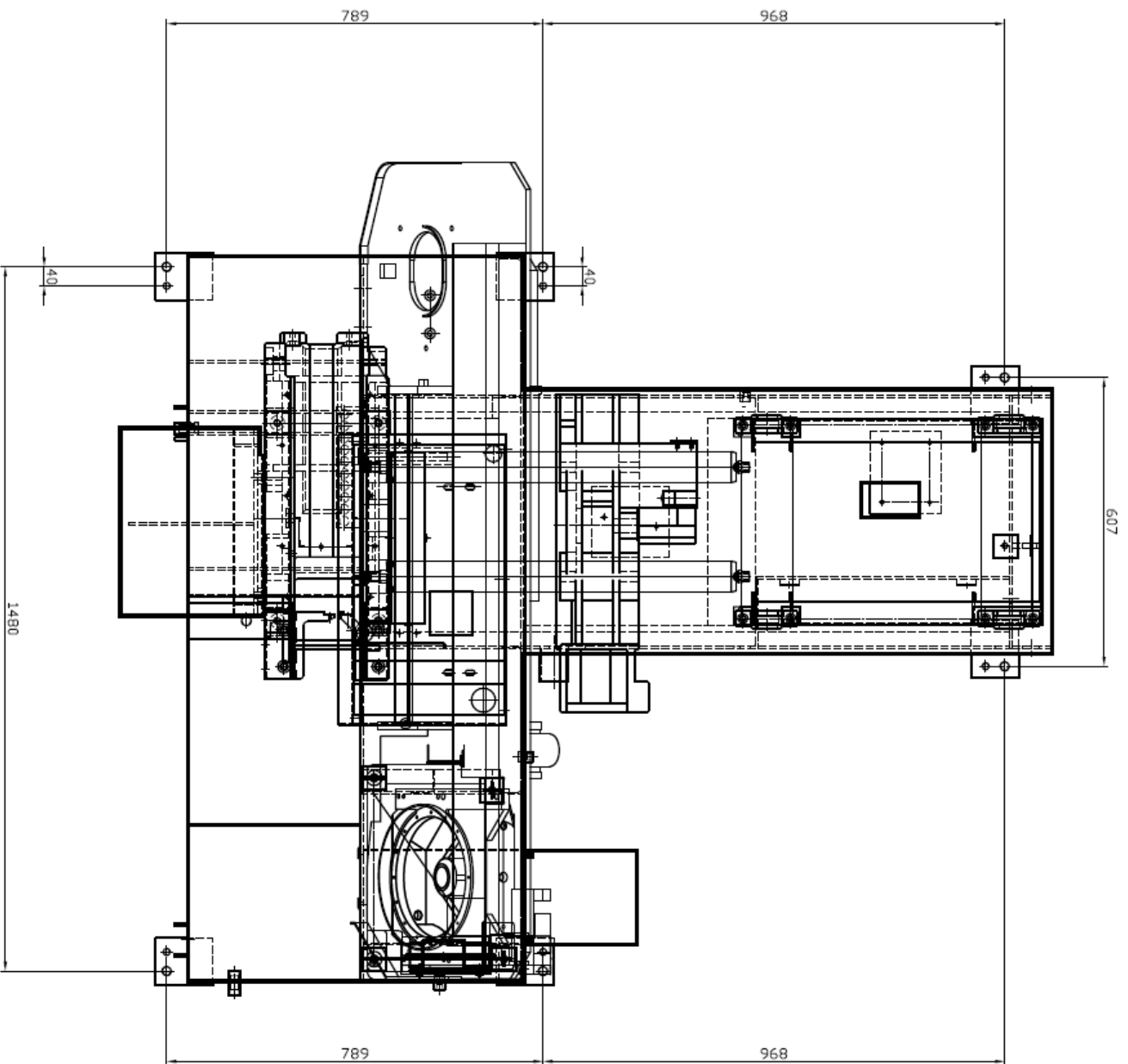


Machine side view

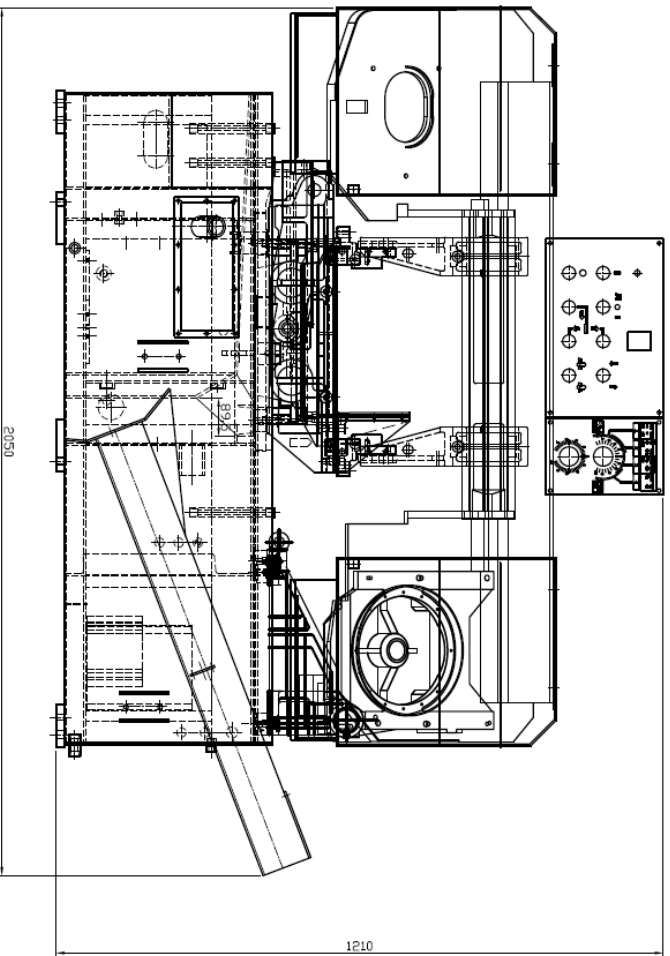


Machine top view

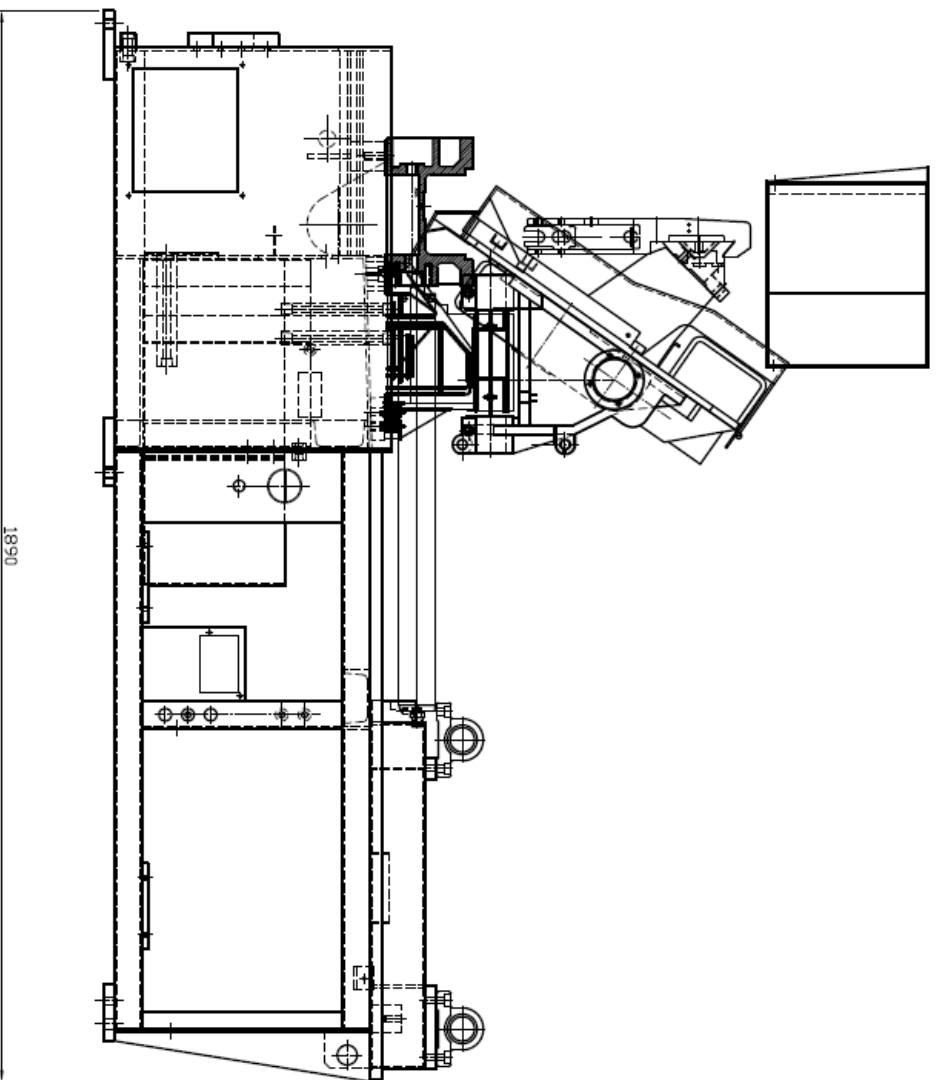
FLOOR PLAN



Machine top view



Machine front view



Machine side view

MOVING & INSTALLATION

LOCATION & ENVIRONMENT

UNPACKING & INSPECTING

LIFTING

REMOVING SHIPPING BRACKET

CLEANING

INSTALLING

RELOCATING

LOCATION & ENVIRONMENT

For your safety, please read all information regarding installation before proceeding. Install your machine in a place satisfying all of the following conditions:

Space:

- Leave enough free space around the machine for loading work and unloading cut-off pieces as well as for maintenance and inspection. Refer to *Section 2 General Information - Specification* for machine dimensions and floor space.

Environment:



- Well lighted (**500 lumen at minimum**).
- Floor kept dry at all times in order to prevent operators from slipping.
- Away from direct exposure to the sunlight.
- Room temperature between 5 °C to 40 °C.
- Humidity level kept at 30%~95%“(without condensation) to avoid dew on electric installation and machine.
- Away from vibration of other machines.
- Away from powders or dusts emitted from other machines
- Avoid uneven ground. Choose a solid level concrete floor which can sustain weight of both machine and material weight.
- Limit the operation area of the machine to staff only.



UNPACKING & INSPECTING

- Unpack your machine carefully to avoid damage to machine parts or surfaces.
- Upon arrival of your new band saw, please confirm that your machine is the correct model and it comes in the same specification you ordered by checking the model plate on the machine base.
- It is also imperative that a thorough inspection be undertaken to check for any damage that could have occurred during shipping. Pay special attention to machine surface, equipments furnished and the electrical and hydraulic systems for damaged cords, hoses and fluid leaks.
- In the event of damage caused during shipping, please contact your dealer and consult about filing a damage claim with the carrier.
- Your machine comes in with a set of tools for you to maintain the machine. The accessories furnished are as follows:
 1. Tool box 1 pc
 2. Grease gun 1 pc
 3. Screwdriver (+, -) 2 pcs
 4. Open-ended spanner 3 pcs
 5. Hexagon wrench 1 set
 6. Chip spade (only for manual models) 1 pc
 7. Operation manual 1 pc



Should you find any missing accessories, please contact your local agent immediately.


LIFTING

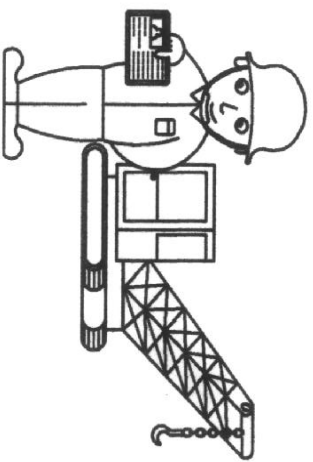
When moving the machine, we strongly suggest you choose any one of the methods described below to move your machine.



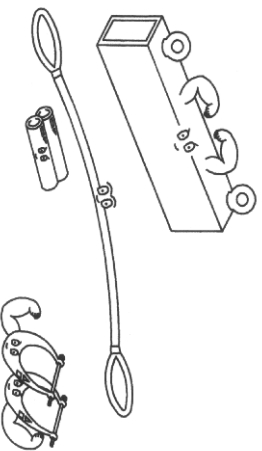
1. Use a crane

Move the machine to its location by using a crane and a wire rope sling that can fully withstand the weight of the machine (refer to machine specification under Section 2 *General Information*).

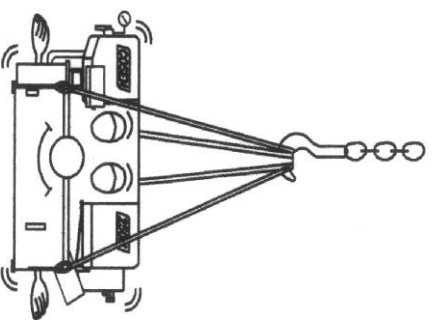
- Machine lifting is likely to damage the machine if not performed properly.
 You must have a qualified crane operator to perform the job.



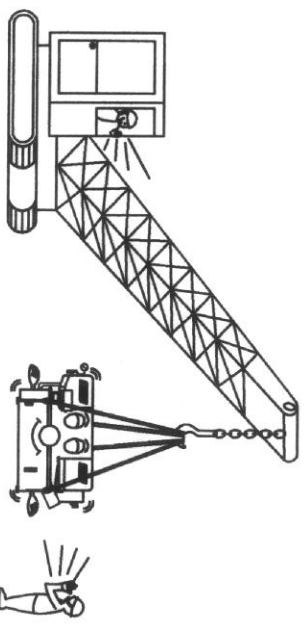
- You must use tools and equipment with the proper tensile strength and use proper method when moving your machine.



- Apply the wire rope sling to the lifting hooks on the four ends of the machine. **Refer to *Illustration: Lifting Points for exact locations*.**



- Slowly lift the machine. Be sure to protect the machine from impact or shock during this procedure. Also watch out your own fingers and feet to avoid injuries.
- Keep the machine well balanced during lifting process and make sure the wire rope does not interfere with the saw frame.
- When you work together with more than two people, it is best to keep constant verbal communication with each other.





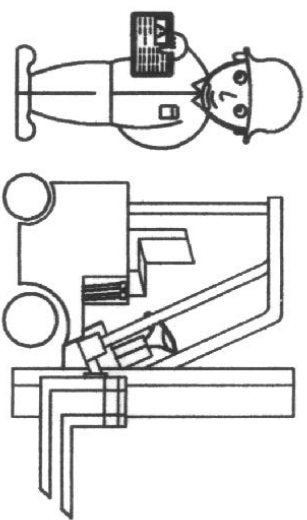
2. Use a forklift

Most users choose this method to move their machine because it is easy to set up. Make sure that the lifting rod can fully withstand the weight of the machine. (Refer to *Section 2 – General Information for Specifications*.)

- Machine lifting is likely to damage the machine if not performed properly.



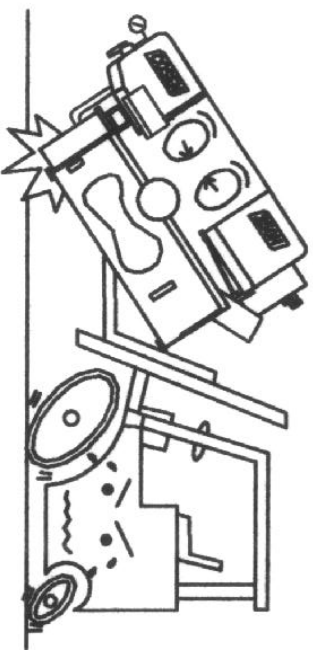
You must have a qualified forklift operator to perform the job.



- You must apply proper forklift technique to avoid damage to the machine.



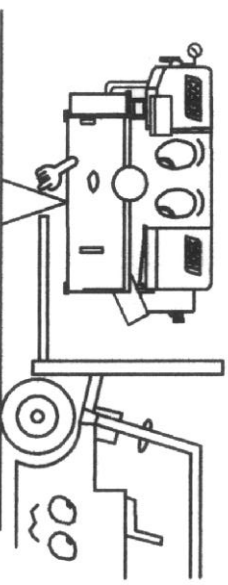
Make sure the forks are able to reach in at least 2/3 of the machine depth.



- You must keep the machine balanced at all times.



Make sure the forks are centered before use.



(Illustration only.)

3. Use rolling cylinders

You can use rolling cylinders to move your machine in a small machine shop environment.

- You must use rolling cylinders made in material of proper compressive strength.

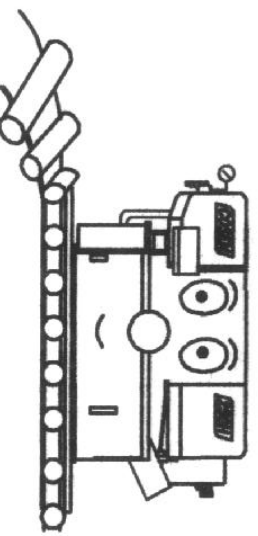
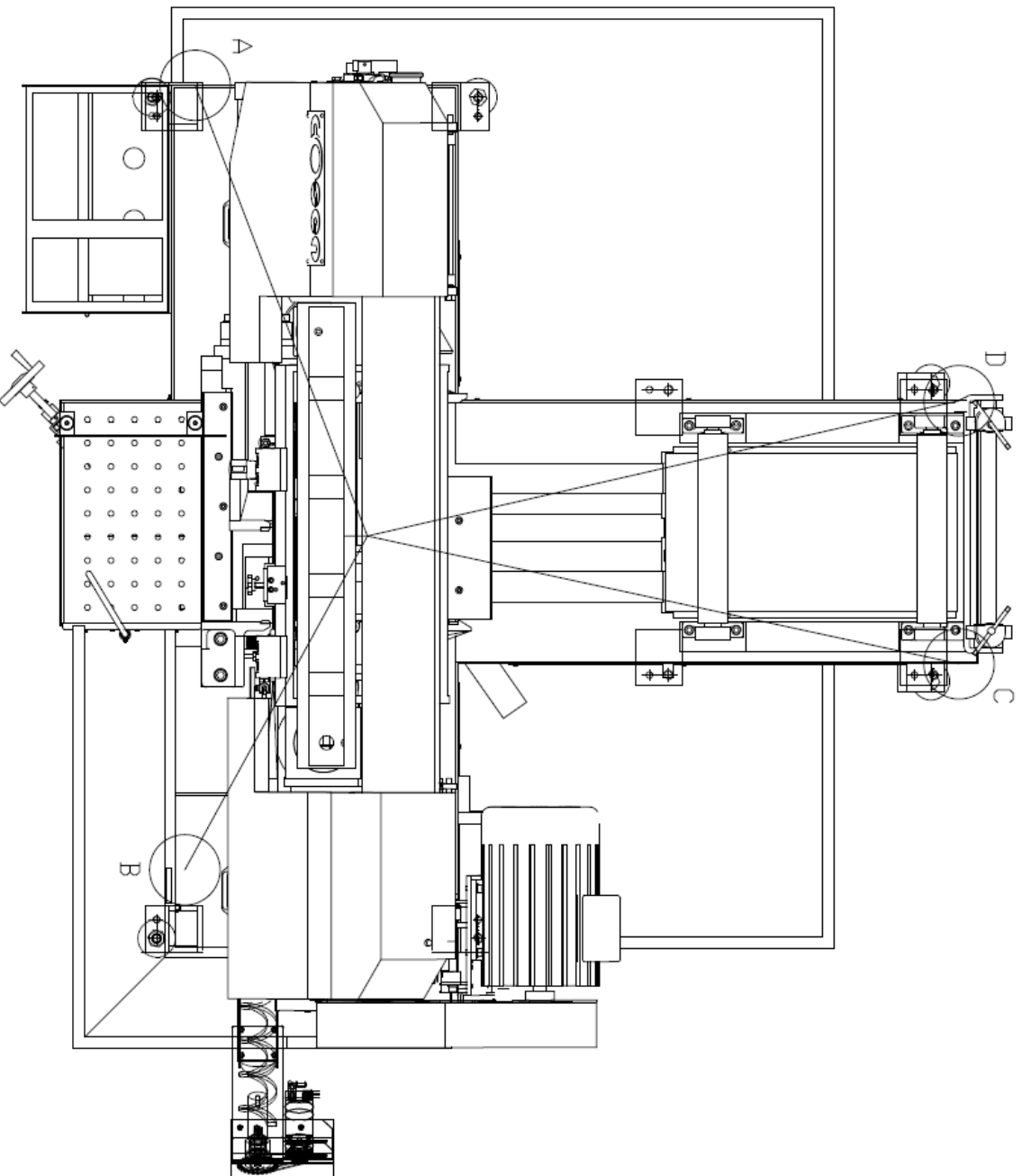


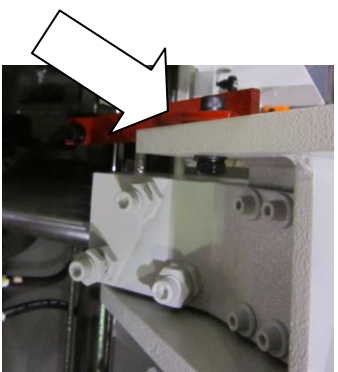
Illustration: Lifting Points



Minimum weight capacity for each wire rope: **2. ton**
Total number of wire ropes required: **4**

REMOVING SHIPPING BRACKET

- After the machine has been properly positioned, remove the shipping bracket that is used to lock the saw frame and the saw bed.
- Retain this bracket so that it can be used again in the event that your machine must be relocated.



CLEANING

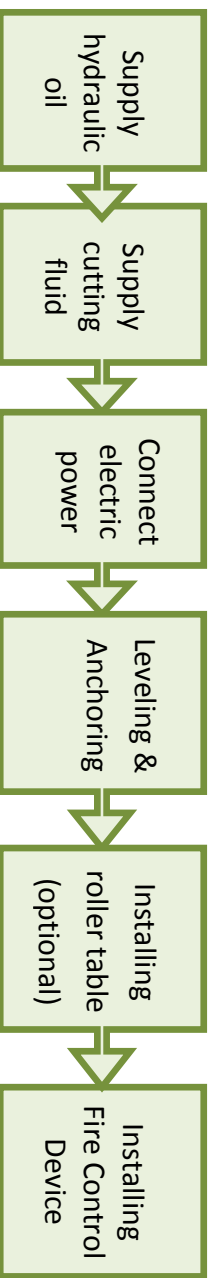
After the machine has been placed at the designated position, remove the rust-preventive grease with wiping cloth dampened with cleaning oil or kerosene. Apply machine oil to machine surfaces that are prone to rust.



Do not remove the rust-preventive grease with a metal scraper and do not wipe the painted surfaces with solvent as doing so would damage surface paint.

INSTALLING

Cosen's bandsaw machine is relatively easy to install. Follow these six easy steps to install your machine.



Supplying hydraulic oil

Open the filler cap and fill the hydraulic oil tank to above 2/3 or full level.

Check the sight gauge to make sure the oil level in the tank.



Refer to specification chart under Section 2 for tank capacity.



Oil tank should be full already if it is a new machine that operates for the first time.



Supplying coolant

Fill the coolant tank to the middle level of the sight gauge by pouring the coolant from above the chip conveyor.

Use the sight gauge to check the coolant level remaining in the tank.



Always check the coolant supply before starting the machine. If the coolant pump is started without enough coolant supply in the tank, the pump and its drive motor may be damaged.



Refer to specification chart under Section 2 *General Information* for tank capacity.



Consult your coolant supplier for bandsaw use regarding coolant type and mix ratio.



Connecting electric power



Have a qualified electrician make the electrical connections.



If the power supply voltage is different from the transformer and motor connection voltage shown on the label attached to the electrical compartment of the machine, contact COSEN or your agent immediately.



Connect to power supply independently and directly. Avoid using the same power supply with electric spark machines such as electric welder. Unstable electric tension may affect your machine's electric installation from working properly.



Ground the machine with an independent grounding conductor.



Supply voltage: 90% - 110 % of nominal supply voltage.



Source frequency: 99% - 101 % of nominal frequency.



Refer to the specification chart under Section 2 for total electric power consumption of the motors and make sure your shop circuit breaker is capable of this consumption amount. Also use a power supply cable of proper size to suit the power supply voltage.


1. Turn off the shop circuit breaker.
2. Make sure the machine circuit breaker switch on the electrical compartment door is turned to OFF.
3. Remove the screw securing the electrical compartment and then open the door.
4. Pull the power supply cable and grounding conductor through the power supply inlet into the electrical compartment. (Shown right)
5. Connect the power supply cable to the circuit breaker (N.F.B.) to the R, S and T terminals, and connect the ground cable to the E terminal.
6. Close the compartment door and fasten the screw back.
7. Turn on the shop circuit breaker and then turn the machine circuit breaker switch to ON. The *Power Indicator* on the control panel will come on.
8. Turn clockwise to unlock the *Emergency Stop* button and press the *hydraulic ON* button to start the hydraulic motor.
9. Make sure the sawing area is clear of any objects. Start the blade and check the blade rotation. If the electrical connections are made correctly, the blade should run in a counterclockwise direction. If not, shut the hydraulics off, turn off the machine as well as the shop circuit breaker. Then swap the power the power cable conductors connected to R and T terminals.
10. Repeat step 6 to 9 to ensure the electrical connections are in the right order.

Leveling

Place spirit level on the vise slide plates and the work feed table.

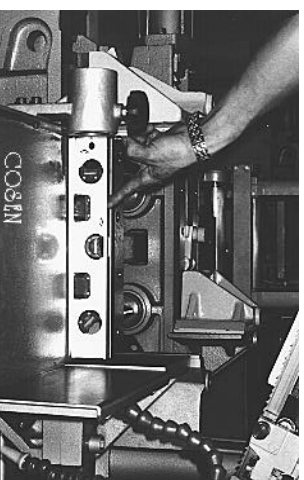
Level the machine in both directions i.e. along and across the machine. Adjust the level of the machine by turning the leveling bolts.

 Make sure all leveling bolts evenly support the machine weight.

 In some cases, leveling the machine with a slight slope toward the front of the machine is recommended as it would prevent coolant from running down cutting material especially tubes or bundles. To do so, make the rear end of the machine approximately 10 mm higher than the level of the front end.



Power Supply Inlet



Anchoring

Normally there is no need to anchor the machine. If the machine is likely to vibrate, fix the machine to the floor with anchor bolts.

Shock absorption steel plates are provided and can be placed under each leveling bolt to prevent their sinking into the concrete floor.

Installing roller table (optional)

The roller table is used to support long material at the rear and/or the front of the machine.

If you have ordered the optional roller table for cutting long material, position it before or behind the machine.

Level the roller table and the stand with the machine by adjusting the leveling bolts.



Installing Fire Control Device

Install a fire extinguisher or any other fire control device in the shop in case a fire breaks out.

RELOCATING

We recommend you follow these procedures when relocating or shipping your machine to other place:

1. Descend the saw frame to its lowest position then turn off the power.
2. Fix the saw frame using the shipping bracket that originally came with the machine.
3. If you are shipping the machine, pack the machine carefully with industrial plastic wraps to protect it from dust.
4. Use a crane or forklift to raise it. If a crane is used to lift the machine, ensure that the lifting cable is properly attached to the machine.
5. Do not forget to include the equipments originally furnished including the shock absorption steel plates and the instruction manual.

OPERATING INSTRUCTIONS

SAFETY PRECAUTIONS
BEFORE OPERATING
CONTROL PANEL
STANDARD ACCESSORIES
OPTIONAL ACCESSORIES
UNROLLING & INSTALLING THE BLADE
BREAKING-IN THE BLADE
ADJUSTING WIRE BRUSH
ADJUSTING COOLANT FLOW
ADJUSTING SAW ARM
ADJUSTING BLADE SPEED
PLACING WORKPIECE ONTO WORKBED
POSITIONING WORKPIECE FOR CUTTING
TEST-RUNNING THE MACHINE
CUTTING OPERATION
STARTING AN AUTOMATIC OPERATION
USING TOP CLAMP FOR BUNDLE CUTTING
TERMINATING A CUTTING OPERATION

SAFETY PRECAUTIONS

For your safety, please read and understand the instruction manual before you operate the machine. The operator should always follow these safety guidelines:



- The machine should only be used for its designated purpose.
- Do not wear gloves, neckties, jewelry or loose clothing/hair while operating the machine.



- For eye protection, always wear protective safety glasses.



- Check the blade tension and adjust blade guides before starting the machine.
- Use auxiliary clamping or supporting devices to fix material in place before cutting long workpieces. Always make sure the material is clamped firmly in place before starting to cut.
- Do not remove jammed or cut-off pieces until the blade has come to a full stop.
- Keep fingers away from the path of the blade.



- Protection devices should be in place at all times. For your own safety, never remove these devices.
- Disconnect machine from the power source before making repairs or adjustments.



- Wear protection gloves only when changing the blade.



- Do not operate the machine while under the influence of drugs, alcohol or medication.



- Do not take your eyes off the machine while in operation.
- Do place warning signs to mark out machine work zone and restrict entry to be staff-only.

BEFORE OPERATING

Choosing an appropriate saw blade and using the right cutting method is essential to your cutting efficiency and safety. Select a suitable saw blade and cutting method based on your work material and job requirements e.g. cutting accuracy, cutting speed, economic concern, and safety control.

Wet cutting

If you choose dry cutting or low-speed cutting, the chips may accumulate in machine parts and may cause operation failure or insulation malfunction. We suggest you choose wet cutting to avoid machine damage.

Cutting unknown materials

Before cutting an unknown material, consult the material supplier, burn a small amount of chips from the material in a safe place, or follow any other procedure to check if the material is flammable.



Never take your eyes off the machine while in operation.

Cutting fluid

For cooling and lubrication purpose, we recommend you use water-soluble cutting fluids. The following table lists out its pros and cons for your reference.

Pro	Con
<ul style="list-style-type: none">• Have a high cooling effect• Not flammable• Economical• Does not require cleaning of the cut products	<ul style="list-style-type: none">• Remove machine paint• Lose its rust protection effect if deteriorated• Tend to create foam• Subject to decay• Decline in performance, depending on the quality of the water used for dilution



Never use water as your coolant.



Always add coolant into water for better mix result.



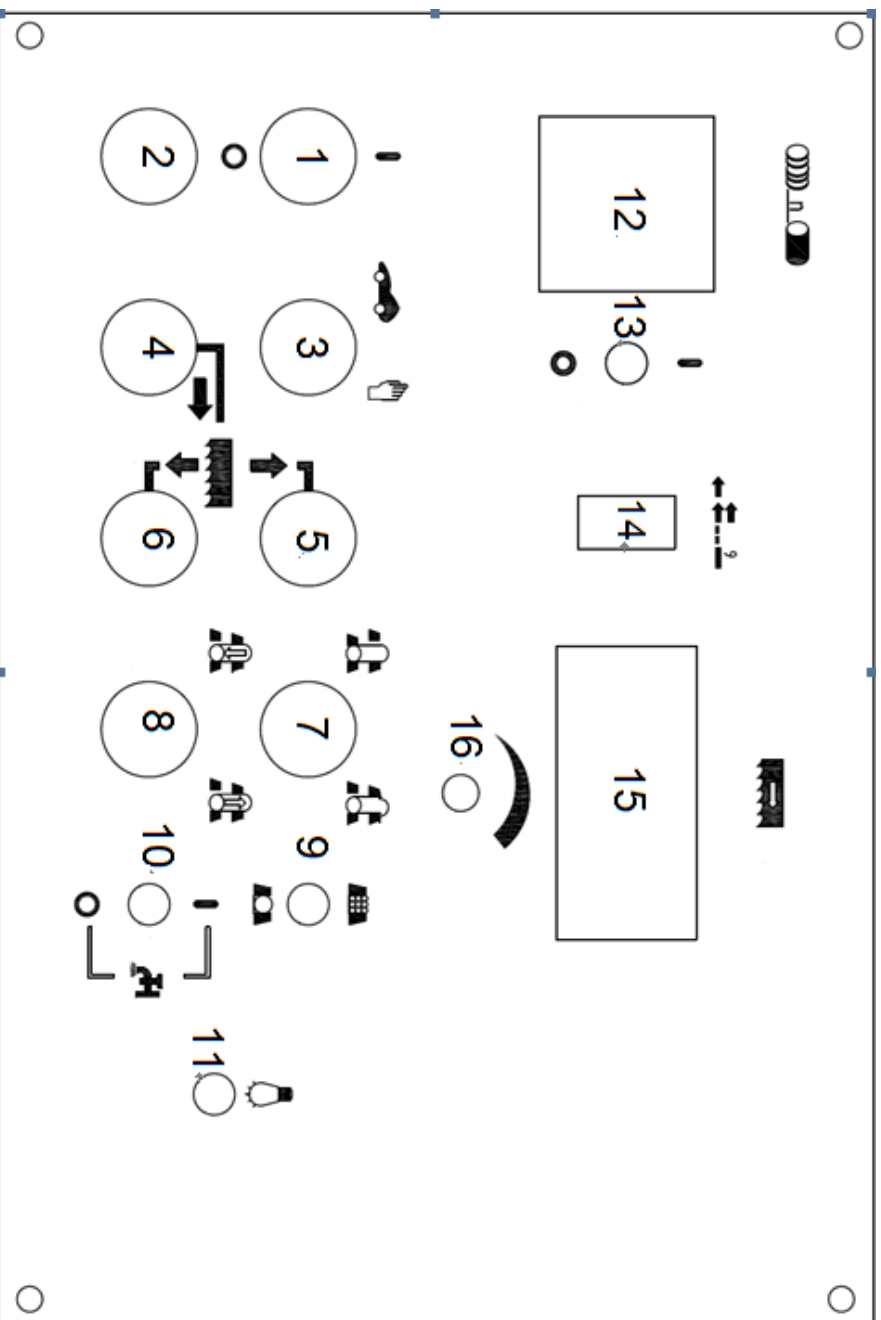
Consult your coolant supplier for bandsaw use regarding coolant type and mix ratio.



Before starting a cutting job, make sure there is sufficient amount of coolant in the tank. Check the fluid level through the sight gauge. Please refer to machine specifications in this manual (Section 2) for tank capacity.

CONTROL PANEL

The control panel is located on the top of the electrical box. It includes the following function: power system, hydraulic system, cooling system and the human-machine-interface (HMI). The operator must fully understand the function of each switch and button before operating the machine.



No.	Control Function	No.	Name
1	POWER "ON" BUTTON INDICATOR LAMP	9	SINGLE / BUNDLE CUTTING SELECTOR
2	POWER "OFF" BUTTON	10	COOLANT PUMP SELECTOR
3	AUTO/Manual mode switch	11	WORK LAMP SWITCH
4	BLADE DRIVE BUTTON	12	CUTTING PIECE COUNTER
5	RISE BUTTON	13	COUNTER ON / OFF SWITCH
6	QUICK APPROACH BUTTON	14	FEEDING TIMES SELECTOR
7	WISE CLAMP SELECTOR	15	BLADE SPEED DISPLAY
8	REAR VISE FORWARD /BACKWARD SELECTOR		

Control Buttons

When the lamp is on, it indicates the power to the machine is turned on.

1. POWER “ON” button indicator lamp

Depressed this button the hydraulic motor and chip conveyor will start and the white light will come on.



When the hydraulic motor is ON, the chip conveyor will run at the same time, please keep your hands away from the chip conveyor.

2. POWER “OFF” button



Depressed this button all of power will shut off and the whole machine operation stops immediately.

*Press to stop the hydraulic pump motor.

* When pressed, it turns off hydraulic pump motor and the built-in light.

3 AUTO/Manual mode switch

Use this switch to select between automatic and manual mode.


- AUTO mode  : used to automatically perform continuous cutting jobs. When switched to this mode, the machine will automatically operate according to the preset parameters.
- Manual mode  : used to perform individual cutting job. When switched to the manual mode, you can execute each individual function.




(1) When the machine is first started in the MANUAL mode and then switched to the AUTO mode, the first cut is not counted, but the machine automatically operates according to the preset cutting data. This function can be used for the machine to automatically cut the work after it trims the end of the work.

(2) In the automatic mode, when the switch is turned to MANUAL during cutting, the machine stops on completion of the cut, and when the switch is turned to MANUAL during the operation other than cutting, the machine stops immediately.

4. BLADE DRIVE button

When the VISE CLAMP SELECTOR [7] is turned to “” and this button is depressed, the blade

motor will operate and the saw head will descend quickly before the limit switch of the quick approach device contact with the workpiece. Thereafter, the sawhead descends at the designated cutting speed.

 : If the VISE CLAMP SELECTOR is turned to “ ”, the blade motor will not operate at all even if this button is depressed.

5. RISE button

When this button is depressed, the blade motor will stop and the sawhead will rise. The sawhead will stop rising at the time when this button is released.

6. QUICK APPROACH button

This button is used to allow the sawhead to approach the workpiece quickly when the saw blade is at a distance from the workpiece. While this button is depressed, the sawhead descends quickly; when the feeler of the quickly approach device contacts with the workpiece, the descending speed of the saw blade automatically changes from the approaching speed to the designated cutting speed.

7. VISE CLAMP selector

After setting the AUTO / MANUAL SELECTOR [3] to “ ”, the motions of front vise and rear vise can be controlled as following.



The front vise closes and the rear vise opens



The front vise open and the rear vise closes

8. REAR VISE FORWARD / BACKWARD selector

The forward and backward motion of the rear vise can be controlled by these two buttons after turning

the AUTO / MANUAL SELECTOR to “”.



FORWARD mode The rear vise moves forward.



BACKWARD mode The rear vise moves backward.



: The rear vise can not be moved forward or backward when the blade motor is running

FORWARD mode

* Press to feed the stock forward.

*The rear vise cannot be moved forward if the front vise and rear vise are both closed. The quick approach feeler may be damaged if the rear vise is moved with the work clamped and in contact with the quick approach feeler.

*The button is engaged when “number 3” AUTO/MANUAL select switch is turned t“”.

BACKWARD mode

Press to feed the stock backward.



The rear vise cannot be moved backward if the front vise and rear vise are both closed. The rear vise cannot be moved either if the quick approach feeler is in contact with the work, or is raised and locked.

The button is engaged when “number 3” AUTO/MANUAL select switch is turned to “”.

The rear vise will not operate for safety measurement if button is pressed when the saw blade motor is operating.

9. **Single/Bundle cutting mode switch**

This button is used to switch between single or bundle cutting mode.

- Switch to single cutting model () to cut a single work piece.
- Switch to bundle cutting mode () to cut a stack of work pieces.

 When under manual and bundle cutting mode, the feeding vise must be touching the front limit switch for the blade to be able to start.

10. COOLANT PUMP selector

I “ON” mode The coolant pump operates and the coolant supply begins.

O “OFF” mode The coolant pump halts and the coolant supply stops.

11. WORKLAMP switch

“ON” mode The work lamp operates.

“OFF” mode The work lamp shut down.

12. CUTTING PIECE counter

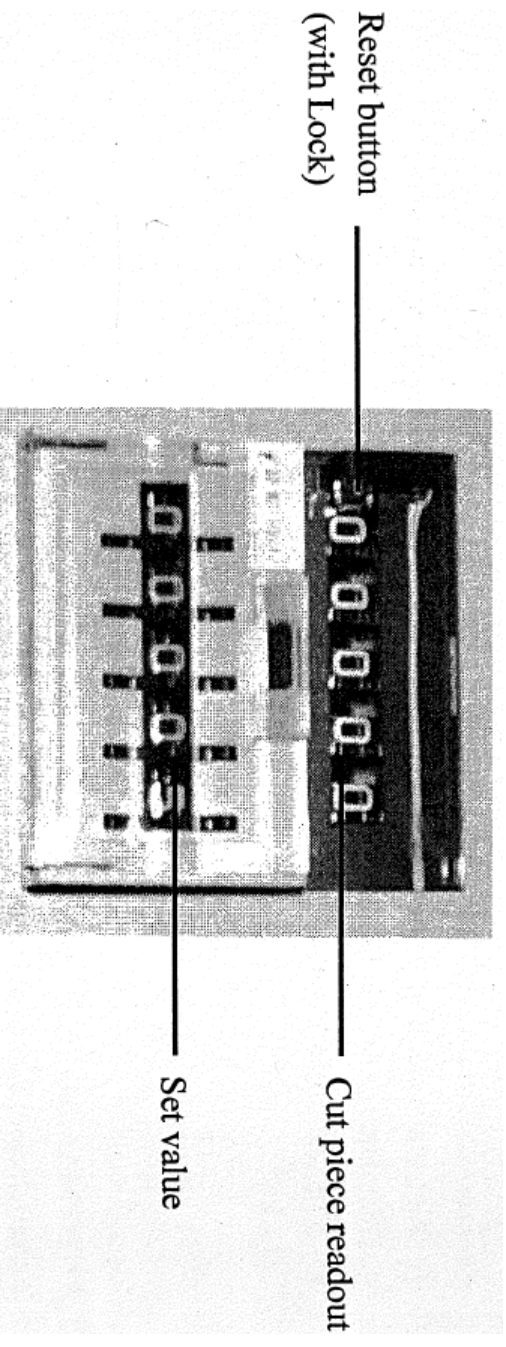
This counter is used to preset the number of cuts required under automatic mode. When the counter reaches the preset number, the machine stops automatically. You can turn cab screw counterclockwise to open plastic protection cover. To activate the counter set according to the following stops:

Preset readout (yellow color digital number):

- Indicates the number of pieces to be cut under  AUTO mode. The setup range is 1~99999.
- You can press “=” type button at top side to change count.

Count readout (white color digital number):

- Automatically counts and indicates the number of pieces already cut under AUTO mode. The count range is 1~99999.
- Press reset button to return zero.



13. COUNTER "ON / OFF" switch

| "ON" mode When the switch is turned to this mode, the "CUTTING PICECS COUNTER" is turned "ON".

○ "OFF" mode When the switch is turned to this mode, the "CUTTING PICECS COUNTER" is turned "OFF".

14. FEEDING TIMES selector

Depress the "-" type button at top or at under side for number changing. When this selector is pressed to "2" the rear vise performs a double (two-times) feeding of the workpiece. On this selector, the maximum cutting length is 3600 mm (141.7 in.) [400 mm x 9]. In addition, if cutting length is 1200mm, then the feeding times should be set to "3". The maximum feeding times are "9".

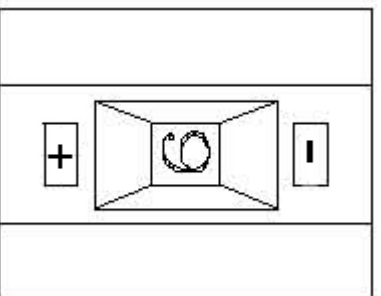
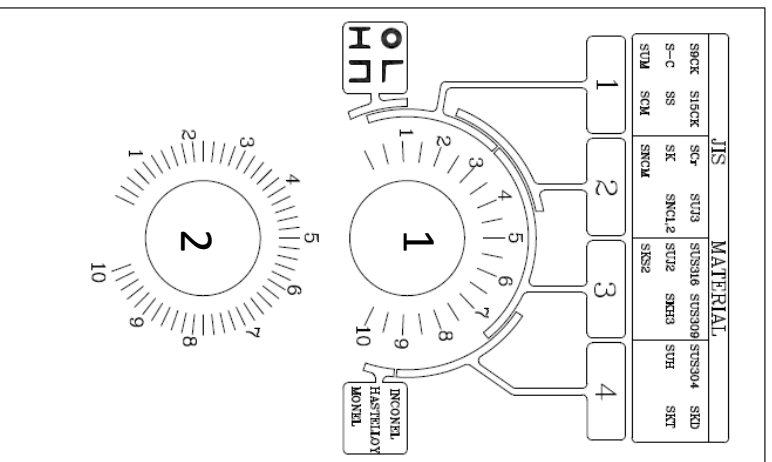


Fig 4-3 Feeding Times selector

15. Blade Descend Pressure and Speed

The part of control panel is where cutting pressure and saw bow descend speed can be adjusted.






Cutting pressure and speed control panel

1. Cutting pressure control knob
 - This pressure control knob is used to adjust the cutting pressure of the blade.
 - Turning the knob clockwise increases the cutting pressure.
 - To obtain a good cutting result, choose the right cutting pressure by turning the knob until it points to your material on the color chart.
2. Blade descend speed control knob
 - This knob is used to adjust the descend speed of the saw blade.
 - Turning the knob clockwise increases the blade descend speed.
 - Blade descend speed is a determining factor to a good cutting time and quality cutoff surface.
 - Set the blade descend speed in accordance with the *cutting pressure control* knob.
 - Also commonly known as the flow control valve

STANDARD ACCESSORIES

Blade tension device

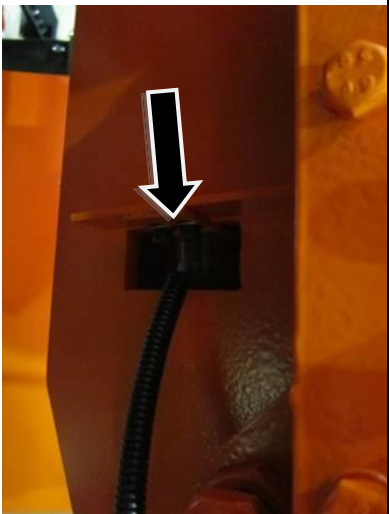


- This blade tension device equipped with hydraulic cylinder provides appropriate tension to the saw blade.
- To tighten the saw blade, turn the selector to .
- Upon saw blade breakage, the safety device will activate and automatically stop all machine operation.
- The limit switch of the safety device can be reset by turning the blade tension selector to .
- To change the blade, turn the handle to  to release saw blade tension.



Never adjust blade tension while the blade is running.

Blade speed/motion detector



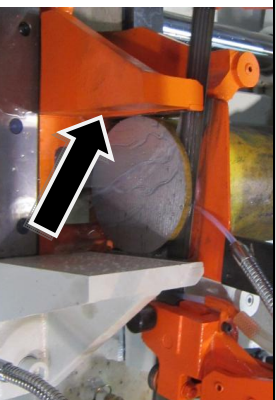
- Besides detecting the blade speed, the speed/motion detector also functions as a safety device.
- The speed/motion detector protects operators and the machine by preventing blade overloads and consequent damages if a saw blade breaks or skids.
- Once blade breakage or slippage is detected, the drive wheel will stop in 10 seconds.

Quick approach device



This device allows the blade to quickly descend to just right above the material to save you operation time.

Split front vises



The split vises are a clever design to make sure your workpiece is tightly clamped by the two vises from both sides of the blade, maximizing stability and cutting precision.

Gear reducer



The specially designed gear reducer can work toward your preset blade speed and torque.



Please refer to Section 6 for information on maintenance.

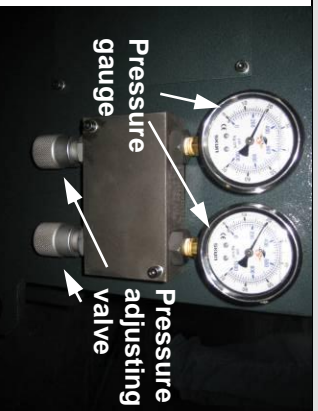
Coolant pump




When the hydraulic system is turned on, the coolant pump can be operated individually from the control panel. Coolant can be used to wash off chips as well as providing cooling during cutting.

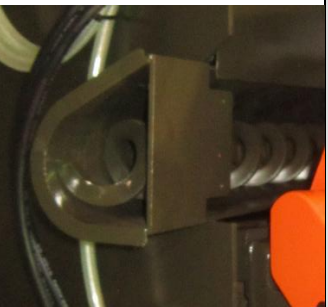
OPTIONAL ACCESSORIES

Vise pressure regulator




- This adjustment valve is used to control vise pressure.
 - Adjust vise pressure based on the material of your workpiece.
 - When cutting pipes or soft materials, reduce vise pressure to prevent exerted pressure from damaging the workpiece shape or exterior.
-  Vise pressure should never be lower than 8 kg/cm².

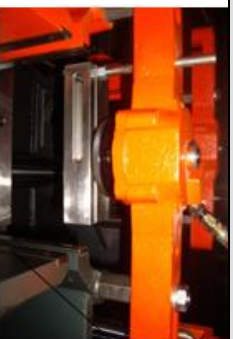
Chip conveyor



Chip conveyor is a spiral device to bring chips out during cutting.

-  As a regular maintenance, remove the chip conveyor and clean all chip deposits inside.

Hydraulic top clamps



Multi Vise connector



- The top clamp device composed of two clamps is installed on top of the front and rear vises before executing bundle cutting.
- Refer to *Using Top Clamp for Bundle Cutting* for operating procedure on bundle cutting.

2M roller table



- The optional 2M roller table supports the work material and ensures the material be fed in smoothly.
- Refer to Section 6 for further information on adjusting the roller table.

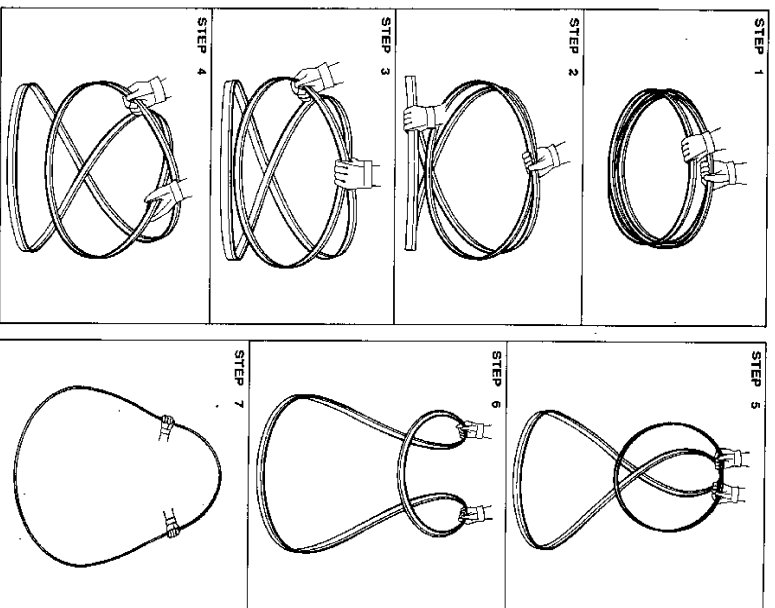
UNROLLING & INSTALLING THE BLADE



Always wear leather gloves and protection glasses when handling a blade.

Unrolling the blade

Please follow the procedures illustrated below.




Unroll and roll the blade



Installing a new blade

Step 1 - Select the most suitable saw blade for your workpiece considering the size, shape and material.

Step 2 - Turn on the machine power by switching to *ON* and turn on the hydraulic system.

Step 3 - Switch to *manual* () mode.

Step 4 - Press the *saw bow up* button and elevate the saw bow until the right insert holder is clear of the front fixed vise.

Step 5 - Turn the tension controller handle from “” to “” position to release tension. The idle wheel will then move slightly toward the direction of the drive wheel.



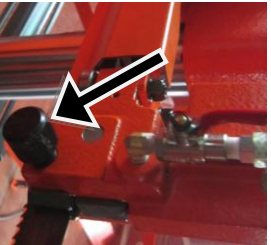
Step 6 - Remove the blade safety cover and open the idle and drive wheel covers.

Step 7 - Press the *Blade Clip* device to hold onto the blade. This device makes blade changing easy and feasible even with only one operator available.

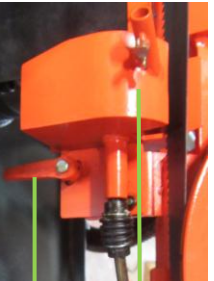


Easy Blade Replacement Device

Step 8 - Loosen the left and right carbide inserts by loosening the “lock nut” shown below.



Step 9 - Open the wire brush cover. Loosen the lock lever and lower the wire brush.



Wire Brush Cover

Lock Lever

Step 10 - Remove the old blade. If necessary, clean the carbide inserts before installing a new saw blade.

Step 11 - Place the new blade around the idle wheel and the drive wheel.

Step 12 - Insert the blade into the left and right tungsten carbide inserts. The back and the sides of the blade need to be touching the inserts as well as the adjacent rollers.


Step 13 - Place the blade to the drive wheel and press the back of the blade against the flange of the drive wheel. Use the *Blade Clip* device to tightly hold the blade from falling out of the drive wheel.



When saw blade begins to rotate, the blade holder will automatically release the blade and fall back to its original position.



Step 14 - Make sure the back of the blade is also pressed against the flange of the idle wheel.

Step 15 - Turn the tension controller handle to [] position to obtain blade tension.

Step 16 - Make sure the sides of the blade are in close contact with the carbide inserts and then tighten the left and right carbide inserts by tightening the “lock nut.”

Step 17 - Gently close the idle and drive wheel covers.

Step 18 - Press the *saw blade start* button to start the blade. Allow the blade to run for a few rotations then press the *saw bow up* button to elevate the saw bow. Open the wheel covers and make sure the blade has not fallen off the drive and idle wheels. If the blade has shifted, follow the same procedure to reinstall the blade again.

Step 19 - Adjust wire brush to a proper position. Refer to *Adjusting Wire Brush* in this section.

BREAKING-IN THE BLADE

When a new saw blade is used, be sure to first break in the blade before using it for actual, extended operation. Failure to break in the blade will result in less than optimum efficiency. To perform this break-in operation, the following instructions should be followed:

Step 1 - Reduce the blade speed to one-half of its normal setting.

Step 2 - Lengthen the cutting time to 2-3 times of what is normally required.

Step 3 - The break-in operation can be considered sufficient if all the unusual noises or metallic sounds have been eliminated.

Step 4 - After the break-in operation is completed, set all parameters back to normal settings.

ADJUSTING WIRE BRUSH

Follow these steps to adjust wire brush to appropriate position:

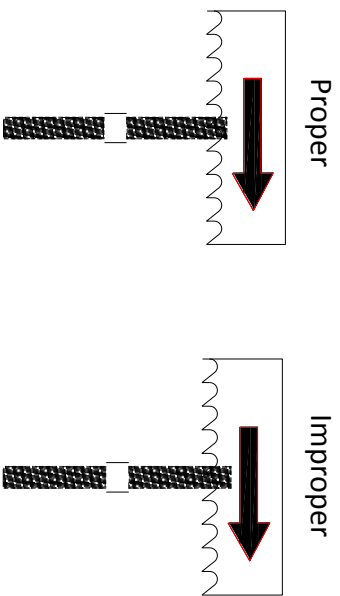
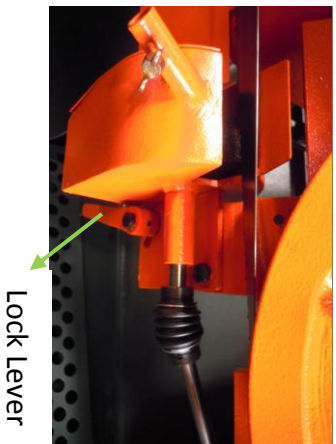
Step 1 - Open the drive wheel cover.

Step 2 - Loosen the lock lever and the wire brush cover.

Step 3 - Move brush up / down until it makes proper contact with the saw blade (see below illustration).

Step 4 - Reinstall the wire brush cover and tighten the lock lever.

Step 5 - Close the drive wheel cover.



ADJUSTING COOLANT FLOW

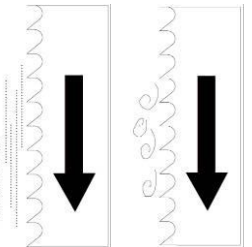
Step 1 – Press the *saw blade start* button to start the saw blade drive motor.

Step 2 – Press the *saw bow down* button to lower the saw bow.

Step 3 – Use the flow control valve (shown below) to adjust the amount of fluid flowing to the cutting area.



Adjust the flow amount if you observe the following changes to the chips generated from cutting.



If the chips are sharp and curved, increase the coolant flow amount.

If the chips are granulated, decrease the coolant flow amount.

ADJUSTING SAW ARM

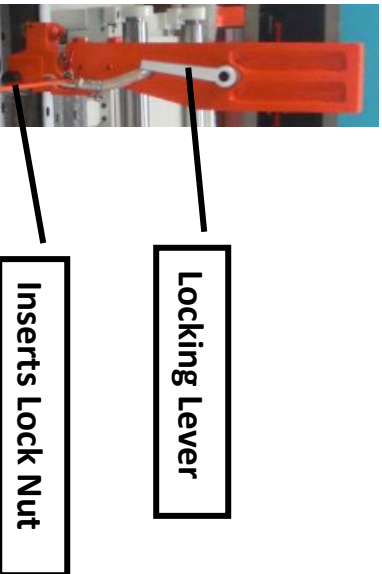
Adjust the blade guide (guide arm) position based on the size of your workpiece:

Step 1 – Loosen the inserts by unlocking the lock nut.

Step 2 – Loosen the blade guide locking lever. Then adjust the guide arm to a position suitable for your workpiece size.

Step 3 – After adjustment is made, tighten the blade guide locking lever.

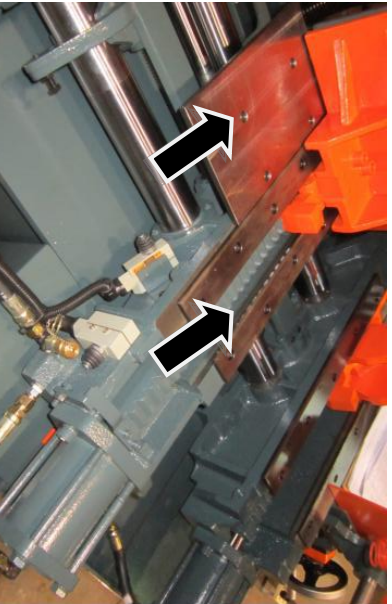
Step 4 – Clamp the inserts back by tightening the lock nut.



PLACING WORKPIECE ONTO WORKBED

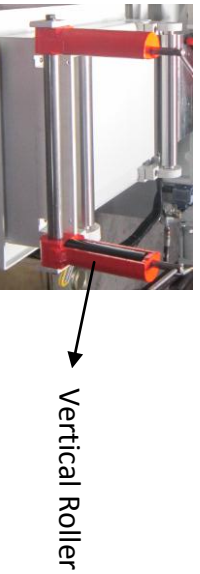
Step 1 – Press the *saw bow up* button and elevate the saw bow until it reaches to its highest point.

Step 2 – Manually lift up the paws and fully open the front and rear vises.









Step 3 – Loosen the vertical roller lock handles and fully open the vertical rollers.

Step 4 – Carefully place the workpiece onto the work feed table to where it extends approximately 30mm (1.2 inch) beyond the rear vise toward the front vise.



POSITIONING WORKPIECE FOR CUTTING

Follow these steps to position your workpiece:

Step	Action
1	Turn the vise clamp switch to the left to open  the rear vise. Lift up the pawl and manually position the rear vise so it pushes against the workpiece. Turn the vise clamp switch to  the right until the workpiece is securely clamped by the rear vise.
2	Move the vertical alignment rollers toward workpiece until it stands against the workpiece. Lock the vertical alignment rollers by tightening the lock handles
3	Press the <i>feed forward</i> button until the rear vise touches the front limit switch.
4	Lift up the pawl and manually position the front vise so it  pushes against the workpiece.
5	Turn the vise clamp switch to the left to open the rear vise.
6	Press the <i>feed backward</i> button until the rear vises reach rear limit switch. 
7	Turn the vise clamp switch to the right until the workpiece is securely clamped by the rear vise.
8	Press the <i>saw bow down</i> button to lower the saw bow until the quick approach bar descends to just about 10mm (0.4 inch) above the workpiece.
	Under no circumstances should the quick approach bar be lowered below the height of the workpiece.
9	Press the <i>feed forward</i> button (and the <i>feed backward</i> button if necessary) until the cutoff point on the workpiece aligns with the blade line.
10	After the workpiece is correctly positioned, turn the vise clamp switch to the left so the workpiece is securely clamped by the front vise. 

TEST-RUNNING THE MACHINE

Test-running this machine can ensure good machine performance in the future. We suggest you run the following tests on the machine before first use:

Testing machine performance:

Turn on the power and run a basic performance test after you finish installing the machine. Follow these steps to test machine performance:

Step 1 – Disassemble shipping brackets and bolts.

Step 2 – Install roller table (optional).

Step 3 – Turn on the relay switch in the control box.

Step 4 – Elevate the saw bow. (If your coolant pump is in reverse and the machine cannot run, please change the electrical phase.)

Step 5 – After the saw bow ascends, extend the quick approach device.

Step 6 – Remove the rust-prevention grease with cleaning oil or kerosene.

Step 7 – Start the coolant pump.

Step 8 – Test these functions under manual mode:

- vise clamping/unclamping
- saw bow ascending/descending
- feeding forward and backward

CUTTING OPERATION

Step 1 – Check before you cut

- Power: Check the voltage and frequency of your power source.
- Coolant: Check if you have sufficient coolant in the tank.
- Hydraulic: Check if you have sufficient (at least two-thirds or higher) hydraulic oil.
- Workbed: Check if there is any object on the feeding bed that may cause interference.
- Blade: Check the blade teeth and make sure there is no worn out teeth along the blade.
- Light: Check the work lamp or laser light (optional) and make sure there is sufficient lighting.
- Roller: Check all the rollers on the front and rear workbed can roll smoothly.
- Saw bow: Check the saw bow to see if it can be elevated and lowered smoothly.

Step 2 – Place your workpiece onto the workbed manually or by using a lifting tool e.g. a crane.

 Before loading, make sure the vises are opened to at least wider than the width of the workpiece.

Step 3 – Position your workpiece.

Step 4 – Clamp the workpiece.

Step 5 – Turn the *cutting pressure control* knob to adjust cutting pressure according to the material.

Step 6 – Adjust *blade descend speed control* knob to obtain a suitable blade descend speed for your material.

Step 7 – Start running the blade.

 Before you start cutting, check again that there is no other object in the cutting area.

Step 8 – While the blade descends, adjust the blade speed if necessary. You can do so by turning the *blade speed control* knob, clockwise to speed up and counterclockwise to slow down. The blade speed is displayed in the HMI touch screen.

Step 9 – Select the proper cutting condition according to different material.

Step 10 – After the entire cutting job is completed, elevate the saw bow to the top and open the vises to remove the workpiece.

Step 11 – Clean the workbed by removing chips and cutting fluids.

Step 12 – Lower the saw bow to a proper position then turn off the power.

STARTING AN AUTOMATIC OPERATION

Step 1 – Use manual mode and cut the edge of the workpiece by using the same procedures as those described under manual operation.

Step 2 – After the trim cut is completed and the saw blade has stopped at the lower limit position, press the *saw blade up* button to raise the saw bow until the quick approach bar is approximately 10mm (0.4inch) above the workpiece.

Step 3 – Turn the *Auto / manual* switch to manual.

Step 4 – Open the front vise.

Step 5 – Feed the workpiece forward to the required cutting position.

Step 6 – Clamp the front vise.

Step 7 – Set the required cutting length on the cutting length preset counter using the following procedures:

- 1) Loosen the lock screw.
- 2) Turn the handwheel to set the required cutting length which was determined in step 4 above on the counter. When setting the required cutting length, be sure to turn the handwheel clockwise to prevent setting error due to backlash.
- 3) Tighten the lock screw.

Step 8 - If the required cutting length is more than 400mm (15.7"). Feed the workpiece twice by turning the feeding times button.

To determining the value to be set on the cutting length preset counter, be sure to sue the following

$$C = \frac{l - t(n - 1)}{n}$$

equation:

where C = Value set on counter (mm)

l = Required cutting length (mm)

t = set with 1.6mm

n = feeding times

For example, when the required cutting length is 600mm, $C = (600 - 1.6 \times (2 - 1)) / 2 = 299.2$ mm

Step 9 – Turn the *Auto / manual* switch to Auto.

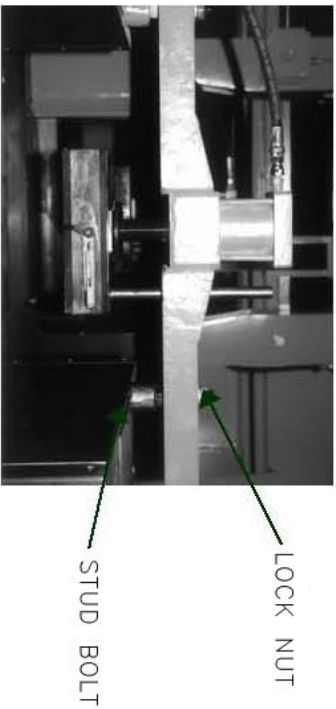
Step 10 – Press the *saw blade start* button and press the *saw bow down* button to start automatic cutting.

USING TOP CLAMP FOR BUNDLE CUTTING

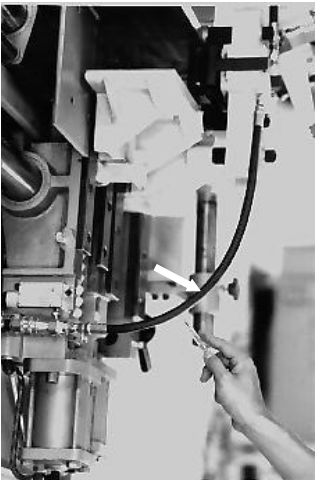
Installing top clamp

To perform bundle cutting, use the top clamps and take the following installation procedures.

Step 1 – Install stud bolts on the front and rear vises and position the top clamp.



Step 2 – Connect the top clamp hoses to the pressure joints on the vise hydraulic cylinders.



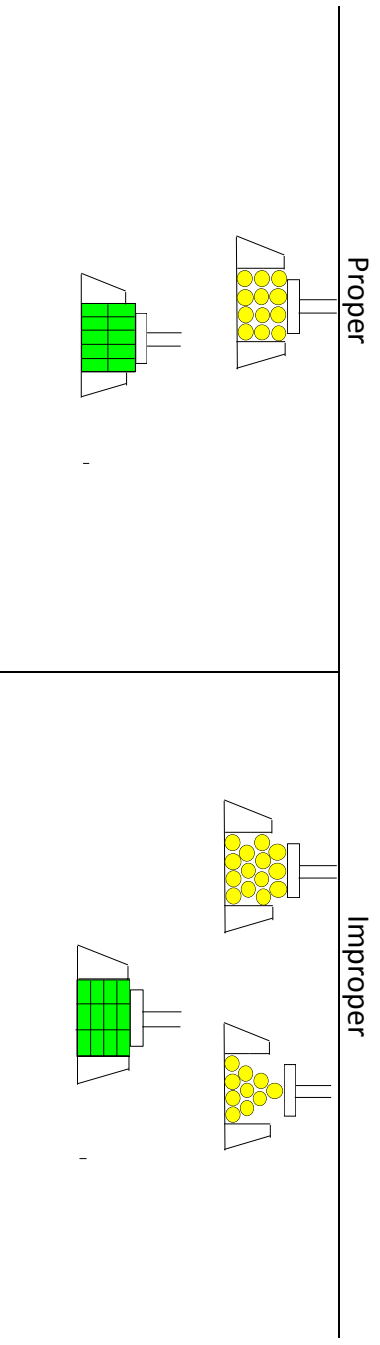
Step 3 – Position the workpiece for bundle cutting.



Note the allowable clamping width and height. (Refer to *Section 2 – General Information*,

Specifications.)

Proper and improper stacking of workpieces



Step 4 – Align the top clamp cylinders with the center of the workpiece and tighten the lock nuts.

Step 5 – Turn the top clamp handles so that the clearance between the top clamp jaw and the top of the bundled workpiece is within 5 to 10 mm (0.2 ~ 0.4 in).

Step 6 – Install the bundle-cutting fence to the work tray. The fence is designed to prevent cut pieces

from scattering across the work tray. Adjust the width of the fence to be slightly larger than the width of the bundle.

Step 7 – Press *Single/Bundle cutting mode* button and switch to bundle cutting mode.

Step 8 – For subsequent cutting procedures, refer to the instructions under manual operation and automatic operation.

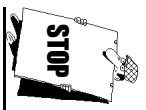
Uninstalling top clamp

Follow these steps to uninstall top clamp for cutting single material:

Step 1 – Disconnect the top clamp hoses.

Step 2 – Loosen the lock nuts and remove the top clamp.

Step 3 – Remove the stud bolts.



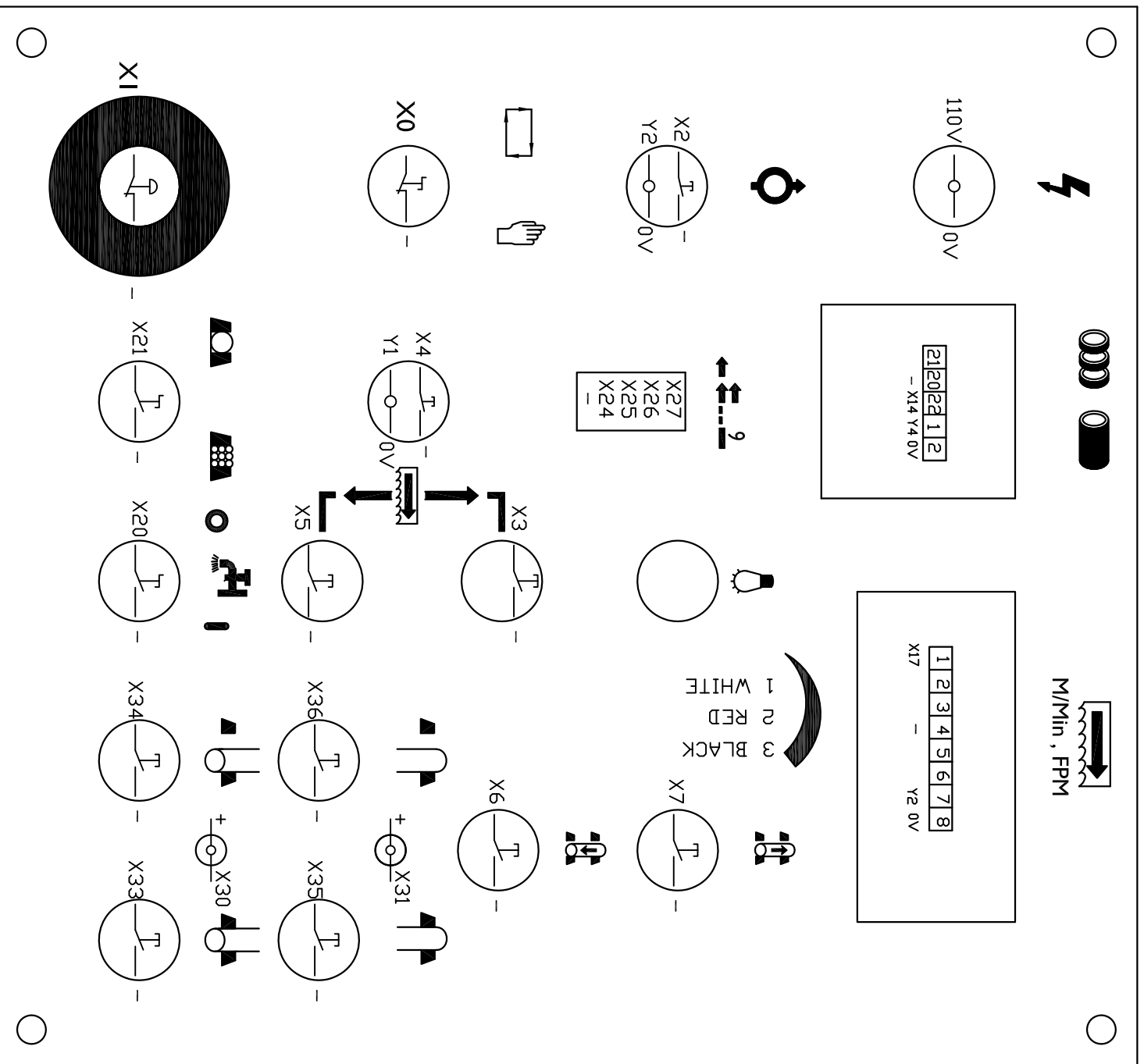
TERMINATING A CUTTING OPERATION

- To terminate a cutting operation, press either the *saw bow up* button or the *emergency stop* button.
- The saw blade will stop running when the *saw bow up* button is pressed.
- Both the saw blade and hydraulic pump motors will stop running when the *emergency stop* button is pressed.
- The machine will stop automatically when an error occurs.

ELECTRICAL SYSTEM

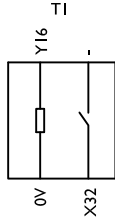
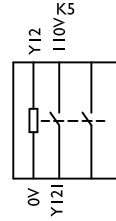
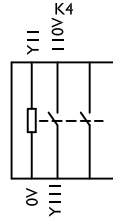
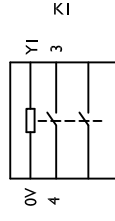
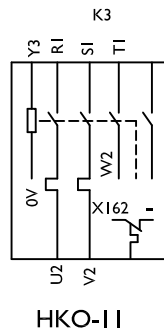
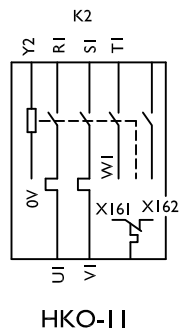
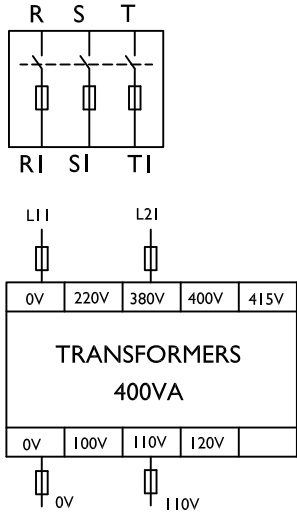
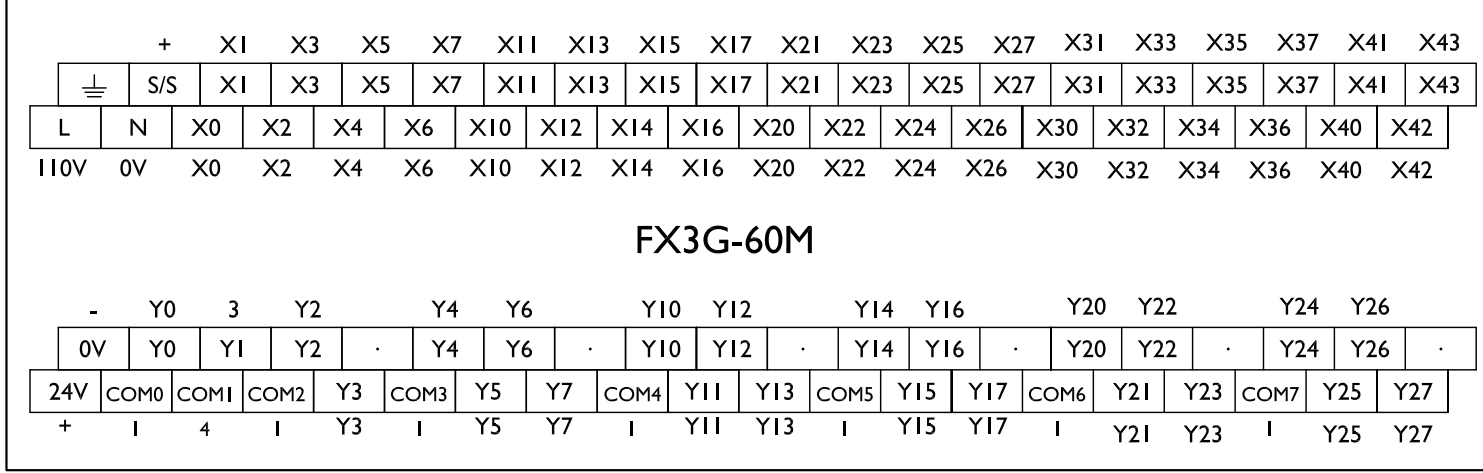
ELECTRICAL CIRCUIT DIAGRAMS

- 5-2 Control Panel Layout
- 5-3 Circuit Board Layout
- 5-4 Power Supply Layout
- 5-5 PLC Input/Output Layout

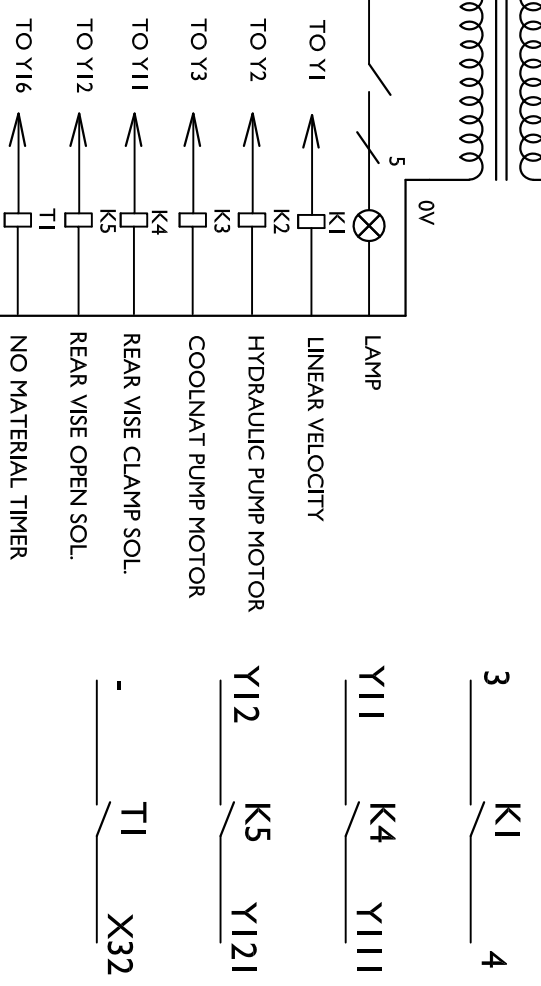
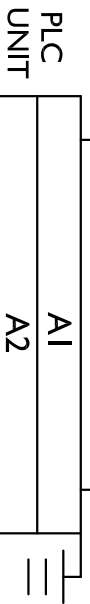
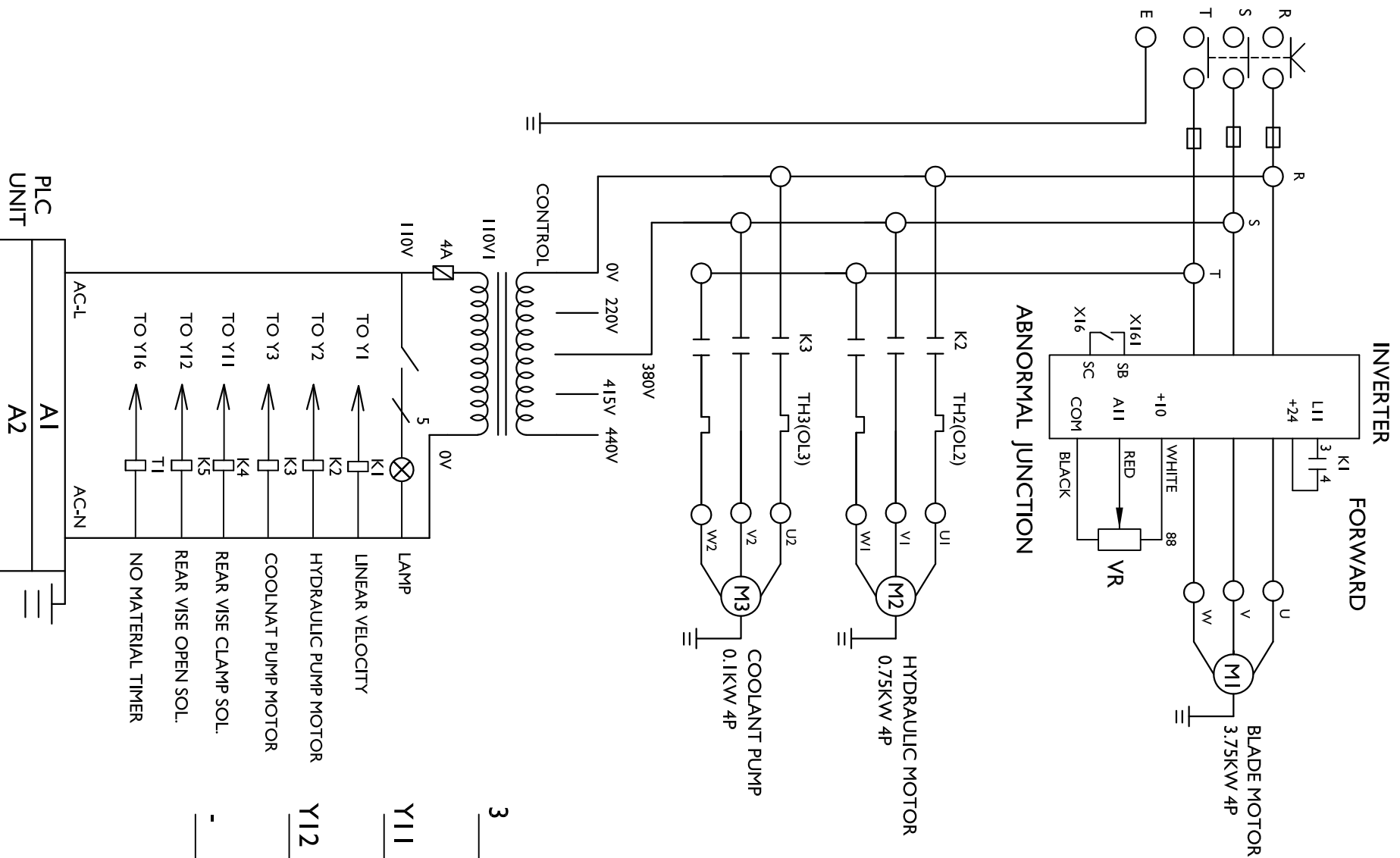


TB-1

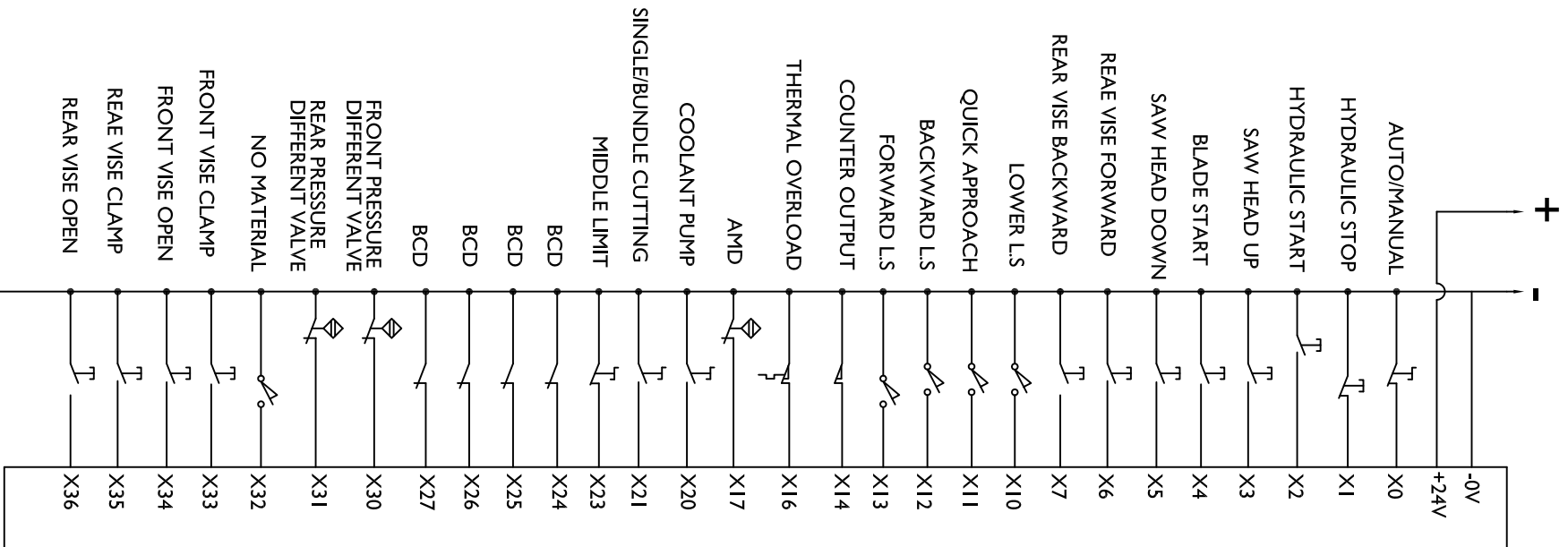
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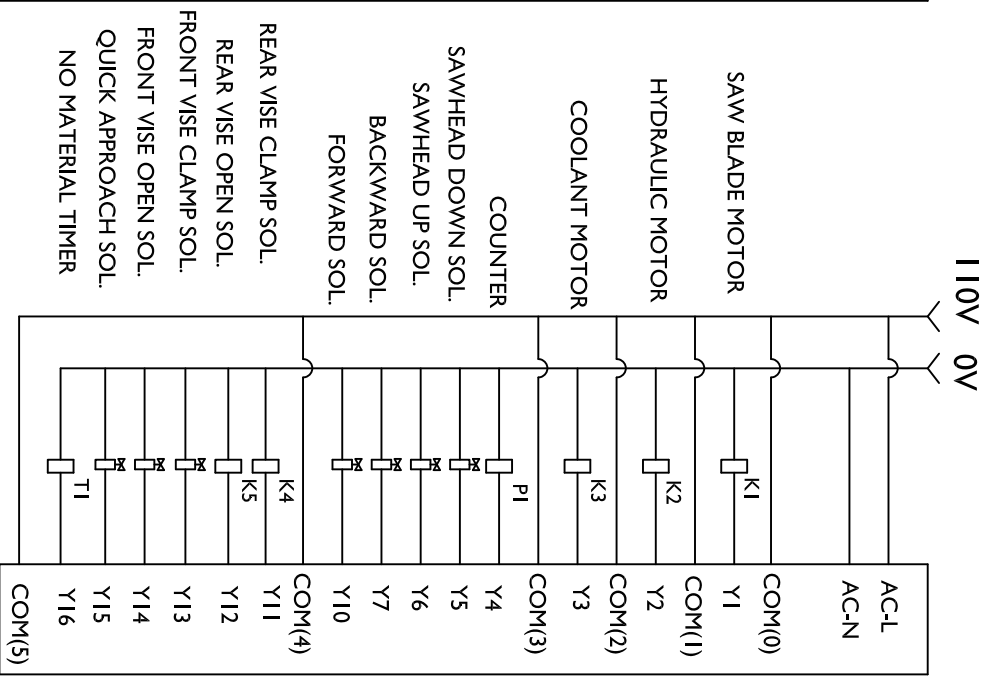
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PLC INPUT MODULE A1



PLC OUTPUT MODULE A2



高雄機械工業股份有限公司
Cosens Machinery Industrial Co., Ltd.

圖名

PLC I/O 配置圖

圖號

EL-AH250H-F15-000S0-D
全行程

繪圖
審核

陳偉松

日期

1001012

版本
S0

Section 6

HYDRAULIC SYSTEM

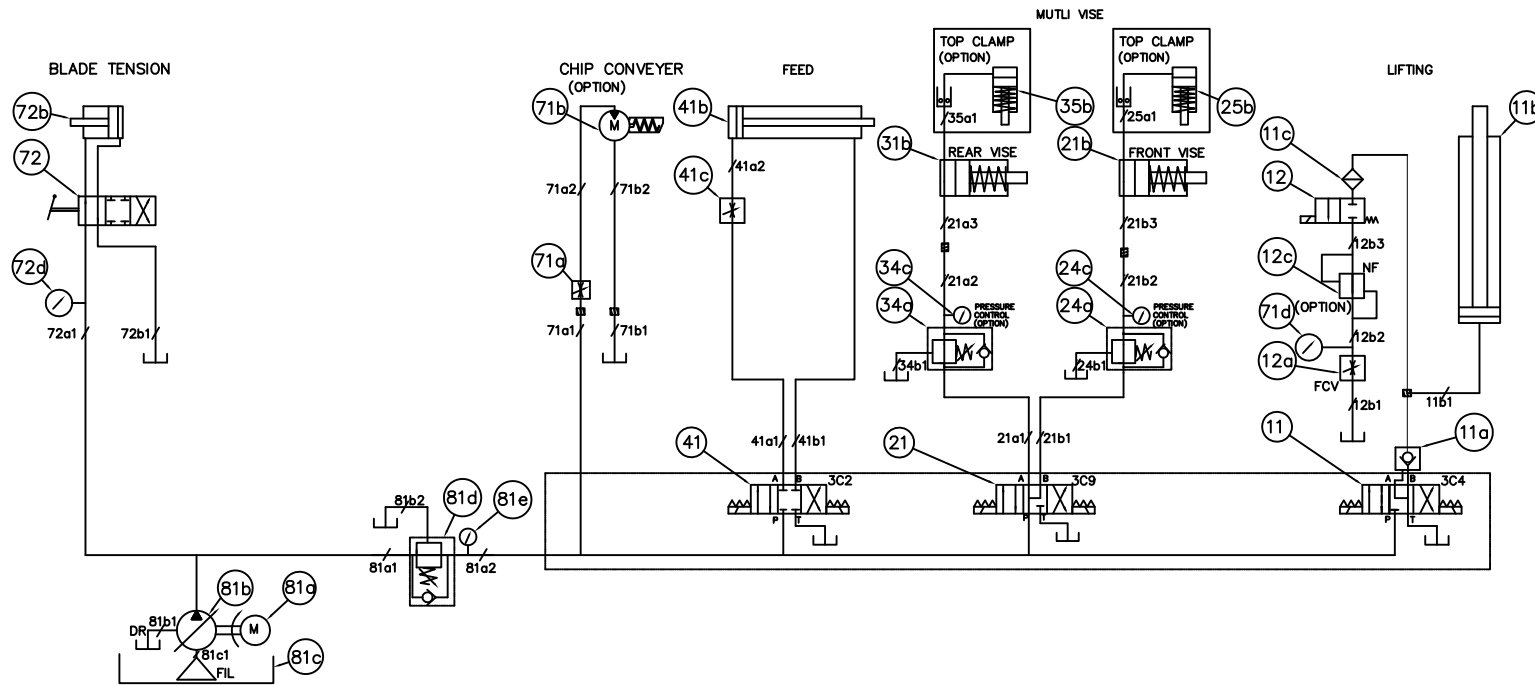
HYDRAULIC CIRCUIT DIAGRAM

COSEN

SW-100A

HYDRAULIC CIRCUIT

AH-250H HYDRAULIC CIRCUIT



COSEN MECHATRONICS CO.,LTD.

DRAW	20150127	SHELBY
CHECK		
APPROVED		
DATE		NAME

TITLE AH-250H HYDRAULIC CIRCUIT

DRAWING NO.05AH-250H*AM11/01(CE)/02(CE)/04/05/06/08/10/12CE

Section 7

BANDSAW CUTTING: A PRACTICAL GUIDE

INTRODUCTION

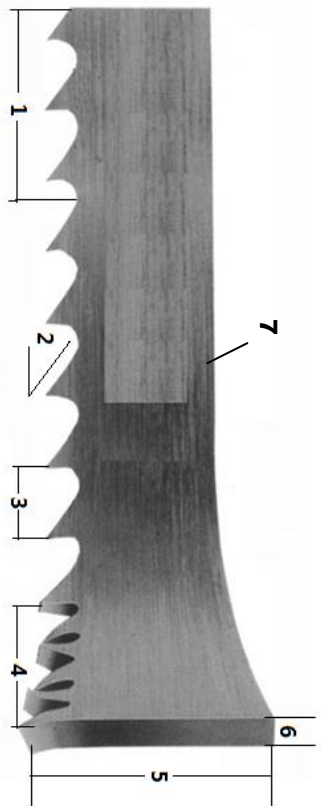
SAW BLADE SELECTION

WISE LOADING

BladeBreak -In

SOLUTIONS TO SAWING PROBLEMS

INTRODUCTION



1. TPI: The number of teeth per inch as measured from gullet to gullet.

2. Tooth Rake Angle: The angle of the tooth face measured with respect to a line perpendicular to the cutting direction of the saw.

3. Tooth Pitch: Tooth pitch refers to the number of teeth per inch (tpi). 1 inch equates to 25.4 mm.

A distinction is made between constant tooth pitches with a uniform tooth distance, 2 tpi for example, and variable tooth pitches with different tooth distances within one toothing interval.

Variable tooth pitches, for instance 2-3 tpi, can be characterized by two measures: 2 tpi stands for the maximum tooth distance and 3 tpi stands for the minimum tooth distance in the toothing interval.

Constant

Variable



4. Set: The bending of teeth to right or left to allow clearance of the back of the blade through the cut.

5. Width: The nominal dimension of a saw blade as measured from the tip of the tooth to the back of the band.

6. Thickness: The dimension from side to side on the blade.

7. Gullet: The curved area at the base of the tooth. The tooth tip to the bottom of the gullet is the gullet depth.

SAW BLADE SELECTION

1. Band length

The dimensions of the band will depend on the band saw machine that has been installed. Please refer to Section 2 – General Information

2. Band width

Band width: the wider the band saw blade, the more stability it will have.

3. Cutting edge material

The machinability of the material to be cut determines what cutting material you should choose.

4. Tooth pitch

The main factor here is the contact length of the blade in the workpiece.

If it is $4P$, $25.4 \div 4 P = 6.35$ mm, that is, one tooth is 6.35 mm.

If it is $3P$, $25.4 \div 3 P = 8.46$ mm If the number is small, it means that the tooth is large.

What is written as $3/4$ is that it is a variable pitch of large (3) / small (4).

The saw blade must contact the cutting material at least two pitches. In the case of a thickness of 15 mm, $4P = OK$, $3P = NG$.

- The surface conditions will also affect the cutting rate. If there are places on the surface on the material which are hard, a slower blade speed will be required or blade damage may result.
- It will be slower to cut tubing than to cut solids, because the blade must enter the material twice, and because coolant will not follow the blade as well.
- Tough or abrasive materials are much harder to cut than their machinability rating would indicate.
- Tooth spacing is determined by the hardness of the material and its thickness in cross section.
- Tooth set prevents the blade from binding in the cut. It may be either a "regular set" (also called a "raker set") or a "wavy set".
- The regular or raker set is most common and consists of a pattern of one tooth to the left, one tooth to the right, and one which is straight, or unset. This type of set is generally used where the material to be cut is uniform in size and for contour cutting.
- Wavy set has groups of teeth set alternately to right and left, forming a wave-like pattern.

This reduces the stress on each individual tooth, making it suitable for cutting thin material or a variety of materials where blade changing is impractical. Wavy set is often used where tooth breakage is a problem. This is shown in Fig. 7.2 as follows:

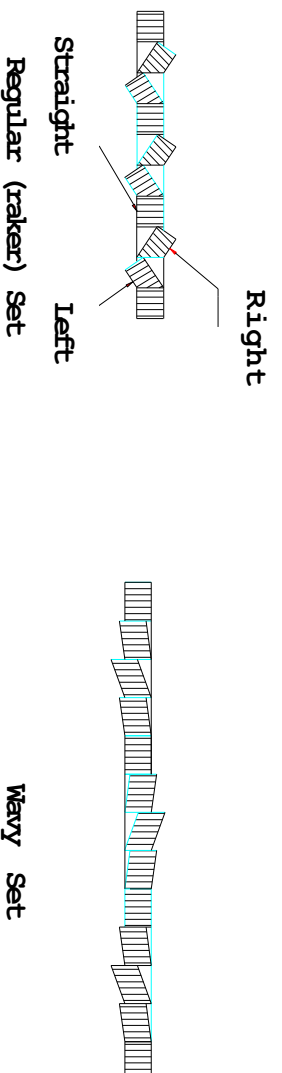
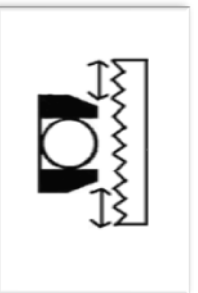


Fig. 7.2 The Saw Set

WISE LOADING

The position in which material is placed in the vise can have a significant impact on the cost per cut.

Often, loading smaller bundles can mean greater sawing efficiency.



When it comes to cutting odd-shaped material, such as angles, I-beams, channel, and tubing, the main point is to arrange the materials in such a way that the blade cuts through as uniform a width as possible throughout the entire distance of cut.

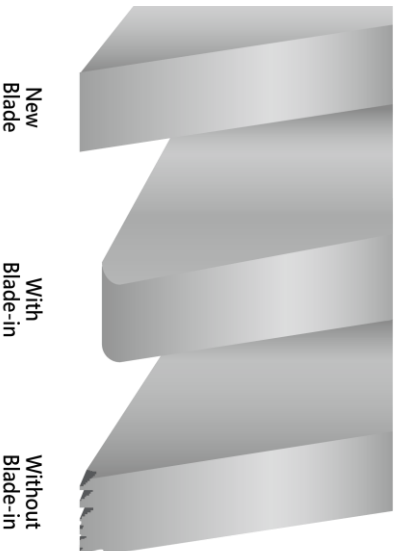
The following diagrams suggest some costeffective ways of loading and fixturing. Be sure, regardless of the arrangement selected, that the work can be firmly secured to avoid damage to the machine or injury to the operator.



BladeBreak -In

Completing a proper break-in on a new band saw blade will dramatically increase its life.

1. Select the proper band speed for the material to be cut.



2. Reduce the feed force/rate to achieve a cutting rate 20% to 50% of normal (soft materials require a larger feed rate reduction than harder materials).

3.Begin the first cut at the reduced rate. Make sure the teeth are forming a chip. Small adjustments to the band speed may be made in the event of excessive noise/vibration. During the first cut, **increase feed rate/force** slightly once the blade fully enters the workpiece. With each following cut, **gradually increase feed rate/force** until normal cutting rate is reached.

MAINTENANCE & SERVICE

INTRODUCTION

BASIC MAINTENANCE

MAINTENANCE SCHEDULE

BEFORE BEGINNING A DAY'S WORK

AFTER ENDING A DAY'S WORK

EVERY MONTH

EVERY THREE MONTHS

EVERY SIX MONTHS

STORAGE CONDITIONS

TERMINATING THE USE OF MACHINE

OIL RECOMMENDATION FOR MAINTENANCE

INTRODUCTION

For the best performance and longer life of the band saw machine, a maintenance schedule is necessary. Some of the daily maintenance usually takes just a little time but will give remarkable results for the efficient and proper operation of cutting.

BASIC MAINTENANCE

It is always easy and takes just a little effort to do the basic maintenance. But it always turns out to be a very essential process to assure the long life and efficient operation of the machine. Most of the basic maintenance requires the operator to perform it regularly.

MAINTENANCE SCHEDULE

We suggest you do the maintenance on schedule.

Before beginning a day's work

1. Please check the hydraulic oil level. If oil level volume is below 1/2, please add oil as necessary. (Filling up to 2/3 level is better for system operation.)
2. Please check the cutting fluid level, adding fluid as necessary. If the fluid appears contaminated or deteriorated, drain and replace it.
3. Please check the saw blade to ensure that it is properly positioned on both the drive and idle wheels.
4. Please make sure that the saw blade is properly clamped by the left and right inserts.
5. Please check the wire brush for proper contact with the saw blade. Replace the wire brush if it is worn out.

After ending a day's work

Please remove saw chips and clean the machine with discharging the cutting fluid when work has been completed.



Do not discharge cutting fluid while the saw blade is operating because it will cause severe injury on operator's hand.



Be sure the saw blade is fully stop, it will be performed after working inspection.

Every month

Please apply grease to the following points:

1. Idle wheel
2. Drive wheel
3. Blade tension device

Recommended Grease:

- Shell Alvania EP Grease 2
- Mobil Mobilplex 48

Every three months

Replace the transmission oil after operating for three months (or 600 hours).

Recommended Grease:

- Shell Alvania EP Grease 2
- Mobil Mobilplex 48 (600W Cylinder oil)

Every six months

1. Clean the filter of the cutting fluid.
2. Replace the transmission oil for every half of a year (or 1200 hours).

Check the sight gauge to ascertain the transmission level.

Recommended TRANSMISSION OIL

- Omala oil HD220
- Mobil comp 632 600W Cylinder oil

3. Replace the hydraulic oil.

Recommended HYDRAULIC OIL

- Shell Tellus 27
- Mobil DTE OIL light Hydraulic28

STORAGE CONDITIONS

Generally, this machine will be stored on the following conditions in future:

- (1) Turn off the power.
- (2) Ambient temperature: 5°C ~ 40°C
- (3) Relative humidity: 30%~95% (without condensation)
- (4) Atmosphere: use a plastic canvas to cover machine to avoid excessive dust, acid fume, corrosive gases and salt.
- (5) Avoid exposing to direct sunlight or heat rays which can change the environmental temperature.
- (6) Avoid exposing to abnormal vibration.
- (7) Must be connected to earth.

TERMINATING THE USE OF THE MACHINE

Waste disposal:

When your machine can not work anymore, you should leak out the oil from machine body. Please storage the oil in safe place with bottom. Ask a environment specialist to handle the oil. It can avoid soil pollution. The oil list in machine:

- Hydraulic oil
- Cutting fluid
- Drive wheel gear oil

OIL RECOMMENDATION FOR MAINTENANCE

Item	Method	Revolution	Suggest oil
Dovetail guide	Keep grease covered. Antirust.	Daily	Shell R2
Roller bearing	Sweep clean and oil with lubricant.	Daily	SEA #10
Bed roller / surface	Sweep clean and oil with lubricant.	Daily	SEA #10
Nipples of bearing	Use grease gun, but not excess.	Monthly	Shell R2
Blade tension device	Use grease gun, but not excess.	Monthly	Shell Alvania EP Grease 2, Mobil Mobilplex 48
Reducer	Inspect once a week. Change oil of 600 hours of using. Change it every year.	Regularly	Omala oil HD220 Mobil Gear 630
Hydraulic system	Inspect half a year. Change oil every year.	Regularly	Shell Tellus 32 Mobil DTE oil Light Hydraulic 24
Bearing	Inserts	Daily	Shell R2
	Band wheel	Weekly	
	Cylinder	6 Monthly	
	Wire brush	6 Monthly	



1. Turn off the stop circuit breaker switch before servicing the machine.
2. Then post a sign to inform people that the machine is under maintenance.
3. Drain all of the cutting fluid and oil off and carefully treat them to avoid pollution.

TROUBLESHOOTING

INTRODUCTION

PRECAUTIONS

GENERAL TROUBLES & SOLUTIONS

MINOR TROUBLES & SOLUTIONS

MOTOR TROUBLES & SOLUTIONS

BLADE TROUBLES & SOLUTIONS

SAWING PROBLEMS & SOLUTIONS

RE-ADJUSTING THE ROLLER TABLE

INTRODUCTION

All the machines manufactured by us pass a 48 hours continuously running test before shipping out and we are responsible for the after sales service problems during the warranty period if the machines are used normally. However, there still exist the some unpredictable problems which may disable the machine from operating.

Generally speaking, the system troubles in this machine model can be classified into three types, namely GENERAL TROUBLES, MOTOR TROUBLES and BLADE TROUBLES. Although you may have other troubles which can not be recognized in advance, such as malfunctions due to the limited life-span of mechanical, electric or hydraulic parts of the machine.

We have accumulated enough experiences and technical data to handle all of the regular system troubles. Meanwhile, our engineering department had been continuously improving the machines to prevent all possible troubles.

It is hoped that you will give us your maintenance experience and ideas so that both sides can achieve the best performance.

PRECAUTIONS

When an abnormality occurs in the machine during operation, you can do it yourself safely. If you have to stop machine motion immediately for parts exchanging, you should do so according to the following procedures:

- Press HYDRAULIC MOTOR OFF button or EMERGENCY STOP button.
- Open the electrical enclosure door.
- Turn off breaker.



BEFORE ANY ADJUSTMENT OR MAINTENANCE OF THE MACHINE, PLEASE MAKE SURE TO TURN OFF THE MACHINE AND DISCONNECT THE POWER SUPPLY.

GENERAL TROUBLES AND SOLUTIONS



DISCONNECT POWER CORD TO MOTOR BEFORE ATTEMPTING ANY REPAIR OR INSPECTION.

TROUBLE	PROBABLE CAUSE	SUGGESTED REMEDY
Motor stalls	Excessive belt tension	Adjust belt tension so that belt does not slip on drive pulley while cutting (1/2" Min. deflection of belt under moderate pressure.)
	Excessive head pressure	Reduce head pressure. Refer to Operating Instructions "Adjusting Feed".
	Excessive blade speed	Refer to Operating Instructions "Speed Selection".
	Improper blade selection	Refer to Operating Instructions "Blade Selection".
Cannot make square cut	Dull blade	Replace blade.
	Guide rollers not adjusted properly	Refer to Adjustments.
	Rear vise jaw not adjusted properly	Set fixed vise jaw 90° to blade.
	Excessive head pressure	Reduce head pressure. Refer to operating instructions "Adjusting Feed."
Increased cutting time	Dull blade	Replace blade
	Insufficient head pressure	Increase head pressure. Refer to Operating Instructions "Adjusting Feed."
	Reduce blade speed	Refer to Operating Instructions "Speed Selection."
Will not cut	Motor running in wrong direction	Reverse rotation of motor. (Motor rotation C.C.W. pulley end.)
	Blade teeth pointing in wrong direction	Remove blade, turn blade inside out. Re-install blade. (Teeth must point in direction of travel.)
	Hardened material	Use special alloy blades. (Consult your industrial distributor for recommendation on type of blade required.)

MINOR TROUBLES & SOLUTIONS

TROUBLE	PROBABLE CAUSE	SUGGESTED REMEDY
Saw blade motor does not run even though blade drive button is pressed.	Overload relay activated	Reset
	Saw blade is not at forward limit position.	Press SAW FRAME FORWARD button

MOTOR TROUBLES & SOLUTIONS

TROUBLE	PROBABLE CAUSE	SUGGESTED REMEDY
Motor will not start	Magnetic switch open, or protector open.	Reset protector by pushing red button (inside electric box.)
	Low voltage	Check power line for proper voltage.
	Open circuit in motor or loose connections.	Inspect all lead terminations on motor for loose or open connections.
Motor will not start, fuse or circuit breakers "blow".	Short circuit in line, cord or plug.	Inspect line, cord and plug for damaged insulation and shorted wire.
	Short circuit in motor or loose connections	Inspect all lead terminations on motor for loose or shorted terminals or worn insulation on wires.
	Incorrect fuses or circuit breakers in power line.	Install correct fuses or circuit breakers.
Motor fail to develop full power. (Power output of motor decreases rapidly with decrease in voltage at motor terminals.)	Power line overloaded with lights, appliances and other motors.	Reduce the load on the power line.
	Undersize wires or circuit too long.	Increase wire sizes, or reduce length of wiring
	General overloading of power company's facilities.	Request a voltage check from the power company
Motor overheat	Motor overloaded.	Reduce load on motor
	Air circulation through the motor restricted.	Clean out motor to provide normal air circulation through motor.
	Short circuit in motor or loose connections.	Inspect terminals in motor for loose or shorted terminals or worn insulation on lead wires.
Motor stalls (Resulting in blown fuses or tripped circuit breakers)	Low voltage	Correct the low line voltage conditions.
	Incorrect fuses or circuit breakers in power line.	Install correct fuses circuit breakers.
	Motor overloaded	Reduce motor load.
Frequent opening of fuses or circuit breakers.	Motor overloaded	Reduce motor load
	Incorrect fuses or circuit breakers.	Install correct fuses or circuit breakers.

BLADE TROUBLES AND SOLUTIONS



DISCONNECT POWER CORD TO MOTOR BEFORE ATTEMPTING ANY REPAIR OR INSPECTION.

TROUBLE	PROBABLE CAUSE	SUGGESTED REMEDY
Teeth strippage	Too few teeth per inch	Use finer tooth blade
	Loading of gullets	Use coarse tooth blade or cutting lubricant.
	Excessive feed	Decrease feed
	Work not secured in vise	Clamp material securely
	Teeth too coarse	Use a finer tooth blade
	Misalignment of guides	Adjust saw guides
	Dry cutting	Use cutting lubricant
	Excessive speed	Lower speed. See Operating Instructions "Speed selection."
Blade breakage	Excessive speed	Reduce feed pressure. Refer to Operating Instructions "Adjusting Feed."
	Excessive tension	Tension blade to prevent slippage on drive wheel while cutting.
	Wheels out of line	Adjust wheels
Blade line Run-out or Run-in	Guides out of line	For a straight and true cut, realign guides, check bearings for wear.
	Excessive pressure	Conservative pressure assures long blade life and clean straight cuts.
	Support of blade insufficient	Move saw guides as close to work as possible.
	Material not properly secured in vise	Clamp material in vise, level and securely.
	Blade tension improper	Loosen or tighten tension on blade.
Blade twisting	Blade not in line with guide bearings	Check bearings for wear and alignment.
	Excessive blade pressure	Decrease pressure and blade tension
	Blade binding in cut	Decrease feed pressure
Premature tooth wear	Dry cutting	Use lubricant on all materials, except cast iron
	Blade too coarse	Use finer tooth blade
	Not enough feed	Increase feed so that blade does not ride in cut
	Excessive speed	Decrease speed

SAWING PROBLEMS AND SOLUTIONS

Other than this manual, the manufacturer also provides some related technical documents listed as follows:

Sawing Problems and Solutions

	Vibration during cutting	Failure to cut	Short life of saw blade	Curved cutting	Broken blade	
✓	✓	✓	✓	✓	✓	Use of blade with incorrect pitch
✓	✓	✓	✓	✓	✓	Failure to break-in saw blade
✓	✓	✓	✓	✓	✓	Excessive saw blade speed
✓	✓	✓	✓	✓	✓	Insufficient saw blade speed
✓	✓	✓	✓	✓	✓	Excessive saw head descending speed
✓	✓	✓	✓	✓	✓	Insufficient saw head descending speed
✓	✓	✓	✓	✓	✓	Insufficient saw blade tension
✓	✓	✓	✓	✓	✓	Wire brush improperly positioned
✓	✓	✓	✓	✓	✓	Blade improperly clamped by insert
✓	✓	✓	✓	✓	✓	Improperly clamped workpiece
✓	✓	✓	✓	✓	✓	Excessively hard material surface
✓	✓	✓	✓	✓	✓	Excessive cutting rate
✓	✓	✓	✓	✓	✓	Non-annealed workpiece
✓	✓	✓	✓	✓	✓	Insufficient or lean cutting fluid
✓	✓	✓	✓	✓	✓	Vibration near machine
✓	✓	✓	✓	✓	✓	Non-water soluble cutting fluid used
✓	✓	✓	✓	✓	✓	Air in cylinder
✓	✓	✓	✓	✓	✓	Broken back-up roller
✓	✓	✓	✓	✓	✓	Use of non-specified saw blade
✓	✓	✓	✓	✓	✓	Fluctuation of line voltage
✓	✓	✓	✓	✓	✓	Adjustable blade guide too far from workpiece
✓	✓	✓	✓	✓	✓	Loose blade guide
✓	✓	✓	✓	✓	✓	Blue or purple saw chips
✓	✓	✓	✓	✓	✓	Accumulation of chips at inserts
✓	✓	✓	✓	✓	✓	Reverse positioning of blade on machine
✓	✓	✓	✓	✓	✓	Workpieces are not bundled properly
✓	✓	✓	✓	✓	✓	Back edge of blade touching wheel flange
✓	✓	✓	✓	✓	✓	Workpiece of insufficient diameter
✓	✓	✓	✓	✓	✓	Saw blade teeth worn
						Use blade with correct pitch suited to workpiece width
						Perform break-in operation
						Reduce speed
						Increase speed
						Reduce speed
						Increase speed
						Increase tension
						Relocate
						Check and correct
						Check and correct
						Soften material surface
						Reduce cutting rate
						Replace with suitable workpiece
						Add fluid or replace
						Relocate machine
						Replace
						Bleed air
						Replace
						Replace
						Stabilize
						Bring blade guide close to workpiece
						Tighten
						Reduce cutting rate
						Clean
						Reinstall
						Re-bundle
						Adjust wheel to obtain clearance
						Use other machine, suited for diameter of workpiece
						Replace
						Replace

SOLUTIONS TO SAWING PROBLEMS

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#1. Heavy Even Wear On Tips and Corners Of Teeth



Probable Cause :

- A. Improper break-in procedure.
- B. Excessive band speed for the type of material being cut. This generates a high tooth tip temperature resulting in accelerated tooth wear.
- C. Low feed rate causes teeth to rub instead of penetrate. This is most common on work hardened materials such as stainless and toolsteels.
- D. Hard materials being cut such as "Flame Cut Edge" or abrasive materials such as "Fiber Reinforced Composites".
- E. Insufficient sawing fluid due to inadequate supply, improper ratio, and/or improper application

#2. Wear On Both Sides Of Teeth



Probable Cause :

- A. Broken, worn or missing back-up guides allowing teeth to contact side guides.
- B. Improper side guides for band width.
- C. Backing the band out of an incomplete cut.

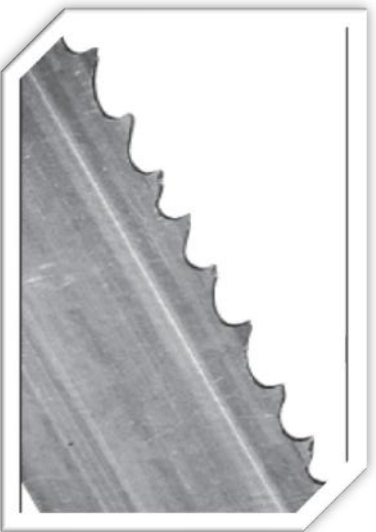
#3. Wear On One Side Of Teeth



Probable Cause :

- A. Worn wheel flange, allowing side of teeth to contact wheel surface or improper tracking on flangeless wheel.
- B. Loose or improperly positioned side guides.
- C. Blade not perpendicular to cut.
- D. Blade rubbing against cut surface on return stroke of machine head.
- E. The teeth rubbing against a part of machine such as chip brush assembly, guards, etc.

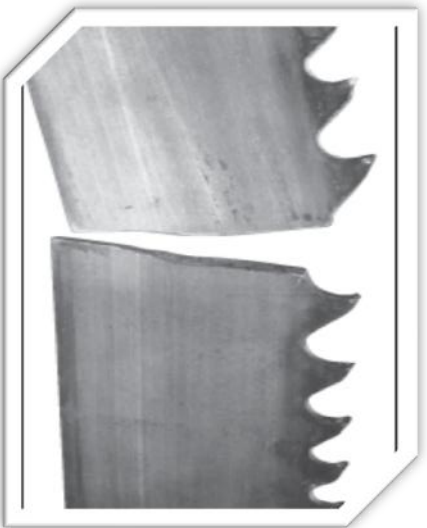
#4. Chipped Or Broken Teeth



Probable Cause :

- A. Improper break-in procedure.
- B. Improper blade selection for application.
- C. Handling damage due to improper opening of folded band.
- D. Improper positioning or clamping of material.
- E. Excessive feeding rate or feed pressure.
- F. Hitting hard spots or hard scale in material

#5. Body Breakage Or Cracks From Back Edge



Probable Cause :

- A. Excessive back-up guide "preload" will cause back edge to work harden which results in cracking.
- B. Excessive feed rate.
- C. Improper band tracking – back edge rubbing heavy on wheel flange.
- D. Worn or defective back-up guides.
- E. Improper band tension.
- F. Notches in back edge from handling damage

#6. Tooth Strippage



Probable Cause :

- A. Improper or lack of break-in procedure.
- B. Worn, missing or improperly positioned chip brush.
- C. Excessive feeding rate or feed pressure.
- D. Movement or vibration of material being cut.
- E. Improper tooth pitch for cross sectional size of material being cut.
- F. Improper positioning of material being cut.
- G. Insufficient sawing fluid due to inadequate supply,improper ratio and/or improper application.
- H. Hard spots in material being cut.
- I. Band speed too slow for grade of material being cut.

#7. Chips Welded To Tooth Tips



Probable Cause :

- A. Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.
- B. Worn, missing or improperly positioned chip brush.
- C. Improper band speed.
- D. Improper feeding rate.

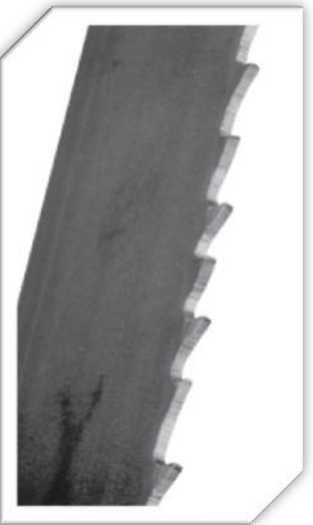
#8. Gullets Loading Up With Material



Probable Cause :

- A. Too fine of a tooth pitch – insufficient gullet capacity.
- B. Excessive feeding rate producing too large of a chip.
- C. Worn, missing or improperly positioned chip brush.
- D. Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.

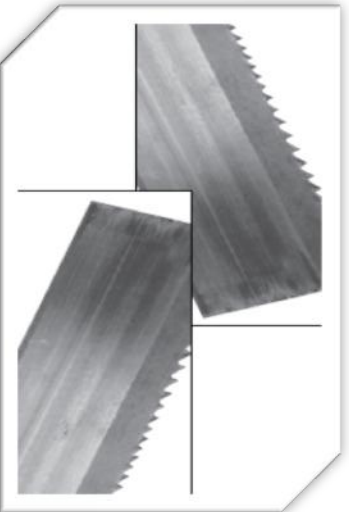
#9. Discolored Tips Of Teeth Due To Excessive Frictional Heat



Probable Cause :

- A. Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.
- B. Excessive band speed.
- C. Improper feeding rate.
- D. Band installed backwards.

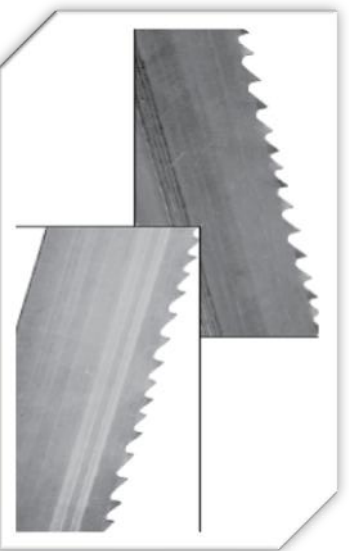
10. Heavy Wear On Both Sides Of Band



Probable Cause :

- A. Chipped or broken side guides.
- B. Side guide adjustment may be too tight.
- C. Insufficient flow of sawing fluid through the side guides.
- D. Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.

#11. Uneven Wear Or Scoring On The Sides Of Band



Probable Cause :

- A. Loose side guides.
- B. Chipped, worn or defective side guides.
- C. Band is rubbing on part of the machine.
- D. Guide arms spread to maximum capacity.
- E. Accumulation of chips in side guides.

#12. Heavy Wear And/Or Swagging On Back Edge



Probable Cause :

- A. Excessive feed rate.
- B. Excessive back-up guide "preload".
- C. Improper band tracking – back edge rubbing heavy on wheel flange.
- D. Worn or defective back-up guides.

#13. Butt Weld Breakage



Probable Cause :

- A. Any of the factors that cause body breaks can also cause butt weld breaks.
(See Observations #5, #15 and #16)

#14. Heavy Wear In Only The Smallest Gullets



Probable Cause :

- A. Excessive feeding rate.
- B. Too slow of band speed.
- C. Using too fine of a tooth pitch for the size of material being cut.

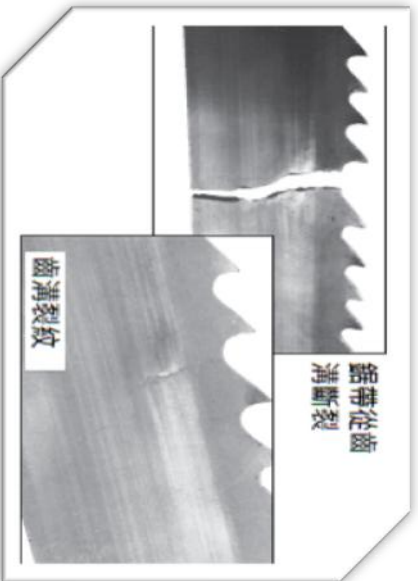
#15. Body Breaking – Fracture Traveling In An Angular Direction



Probable Cause :

- A. An excessive twist type of stress existed.
- B. Guide arms spread to capacity causing excessive twist from band wheel to guides.
- C. Guide arms spread too wide while cutting small cross sections.
- D. Excessive back-up guide "preload".

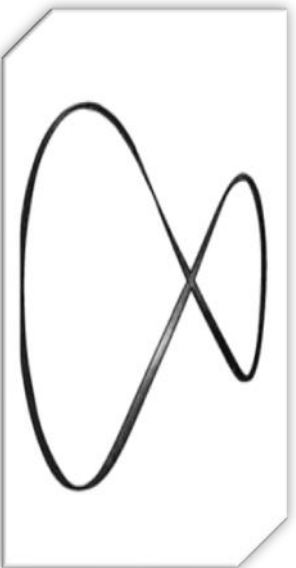
#16. Body Breakage Or Cracks From Gulleets



Probable Cause :

- A. Excessive back-up guide "preload".
- B. Improper band tension.
- C. Guide arms spread to maximum capacity.
- D. Improper beam bar alignment.
- E. Side guide adjustment is too tight.
- F. Excessively worn teeth.

#17. Band is Twisted Into A Figure "8" Configuration



Probable Cause :

- A. Excessive band tension.
- B. Any of the band conditions which cause the band to be long (#18) or short (#19) on tooth edge.
- C. Cutting a tight radius.

#18. Used Band Is "Long" On The Tooth Edge



Probable Cause :

- A. Side guides are too tight – rubbing near gulleets.
- B. Excessive "preload" – band riding heavily against back-up guides.
- C. Worn band wheels causing uneven tension.
- D. Excessive feeding rate.
- E. Guide arms are spread to maximum capacity.
- F. Improper band tracking – back edge rubbing heavy on wheel flange.

#19. Used Band Is "Short" On The Tooth Edge



Probable Cause :

- A. Side guides are too tight – rubbing near back edge.
- B. Worn band wheels causing uneven tension.
- C. Guide arms are spread too far apart.
- D. Excessive feeding rate.

#20. Broken Band Shows A Twist In Band Length



Probable Cause :

- A. Excessive band tension
- B. Any of the band conditions which cause the band to be long (#18) or short (#19) on tooth edge.
- C. Cutting a tight radius.

RE-ADJUSTING THE ROLLER TABLE

If the feeding table suffers the huge stroke and the alignment is effected, follow the below procedure to adjust.

TOOL, measuring

Measurement, Horizontal balance

Procedure

1. Screw or loosen the adjusting bolt to attain the horizontal balance (leveling) between the roller table and the machine frame.
2. Ensure that the machine frame is not struck by the loaded material on the feeding table.
3. Check the leveling by the measuring tool.
4. After finished the adjusting, fix the roller table.



If the feeding table and the machine frame are not positioned under the horizontal balance, the loaded material may be going up gradually and affect the cutting effect.

Warranty

Warranty

New machines are warranted to be free from defects in workmanship and material for a period of one (1) Year from the date of shipment by Seller. The warranty period is based on normal usage of two thousand eighty hours (2080) per year and is reduced proportionately for any excess usage. Products, which under normal operating conditions in Buyer's plant are defective in workmanship or material, will be repaired or replaced at the option of Seller.

This warranty does not cover shipping freight charges for either the return of the defective part or for the shipping of the replacement or repaired part.

Seller will have no obligation to repair or replace perishable parts, or materials or parts damaged by misuse, negligence or failure of Buyer to provide appropriate maintenance and service as stated in the operator's manual or industry standard and normally acceptable practices.

This warranty does not apply if the machine has been altered or modified without our prior written consent.

In the case of components or units purchased by Seller including work holding devices, tool holders, motors and controls, the warranty shall not exceed that received by Seller from the supplier of such components or units.

Seller will not assume responsibility for products or components returned to Seller without prior consent or for unauthorized repairs to its products, even though defective.

Electrical Equipment: The warranty available for all electrical components to the Buyer will be voided if the voltage supplied to the machine is found to be outside the stated voltage of the machine by +/- 10% and/or grounded at machine.

Accessories Supplied with Manufacturer's Equipment: The warranties available to the Buyer are those extended by the accessory manufacturer, if any, to the extent they are in force and effect. The ACCESSORY MANUFACTURER'S WARRANTY, if any, is exclusive and is in lieu of all other warranties whether written, oral or implied.

PARTS

SPARE PARTS RECOMMENDATIONS

PART LIST

SPARE PARTS RECOMMENDATIONS

The following table lists the common spare parts we suggest you purchase in advance:

Part Name	Part Name
Saw blade	Coolant tank filter
Wire brush	Steel plates
Carbide inserts	Rollers
Bearings	Belt
Hydraulic tank leak-proof gasket	Duster seal
Rubber washer	Snap ring
Oil seal	O-ring

