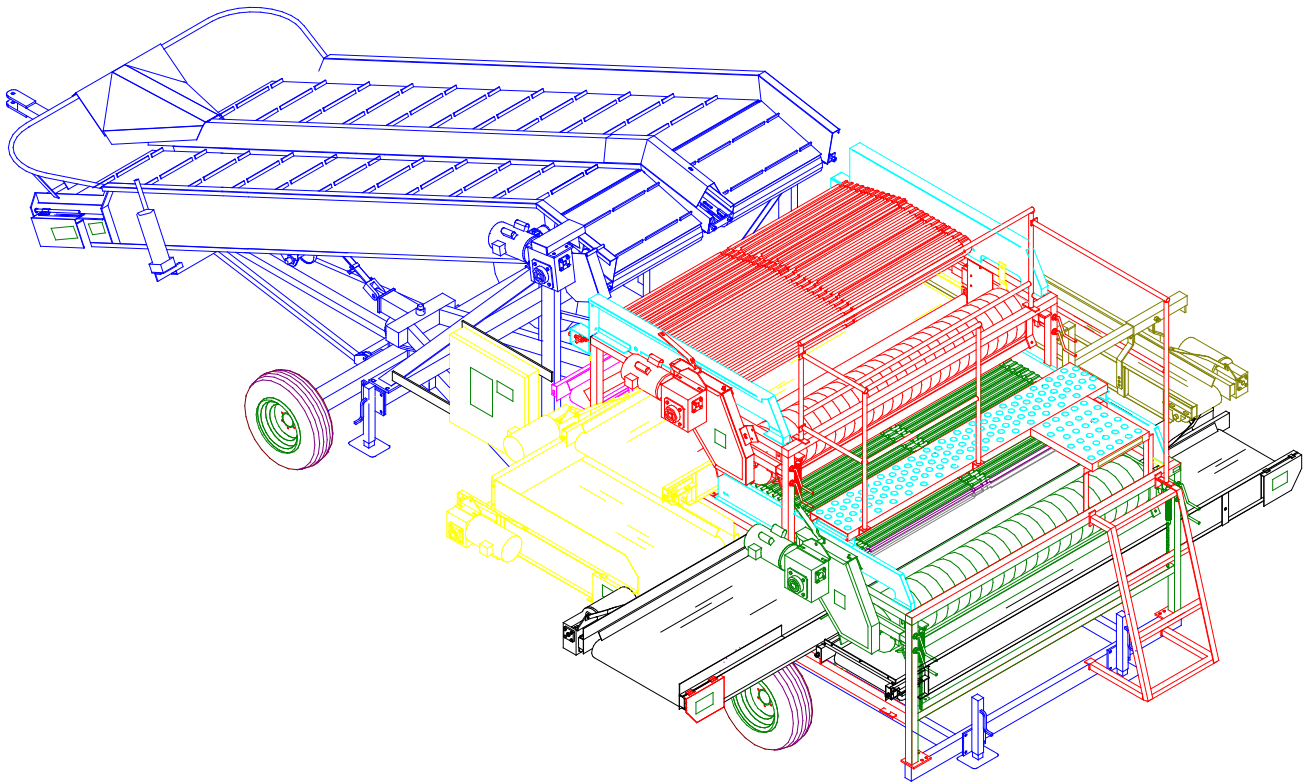


Harriston Industries, Inc.



CLOD HOPPER OPERATORS MANUAL

HARRISTON INDUSTRIES, INC. CLOD HOPPER

WARRANTY

HARRISTON INDUSTRIES, INC. (Harriston) warrants the Harriston Clod Hopper to be free from defects in material and workmanship, under normal use and service. Obligation under this warranty shall extend for period of 1 year (12 months) following the date of delivery to the original purchaser and shall be limited to, at the option of Harriston, replacement or repair of any parts found, upon inspection by Harriston, to be defective.

WARRANTY CLAIMS

The purchaser claiming under this warranty shall submit a warranty claim to Harriston or an authorized dealer, for inspection by an authorized company representative. Should any part prove defective within one year from date of purchase, the part will be replaced without charge, provided the defective part is returned to us, transportation charges prepaid.

LIMITATIONS OF LIABILITY

This warranty is expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on our part of any kind or character, including liabilities for alleged representations or negligence. We neither assume nor authorize any other person to assume on our behalf, any liability in connection with the subsequent sale of the Clod Hopper.

This warranty does not cover parts and accessories, which are under separate guarantees from the manufacturers and service facilities in Canada or the United States.

This warranty shall not apply to any Clod Hopper which has been altered outside the factory in any way so as, in the judgment of Harriston, to affect its operation or reliability, or which has been subject to misuse, neglect, or accident.

No warranty is extended to regular service items such as lubricants, paint, and the like.

OPERATOR'S MANUAL

The Purchaser acknowledges having received training in the safe operation of the Clod Hopper and further acknowledges that Harriston does not assume any liability resulting from the operation of the Clod Hopper in any manner than described in the Operator's Manual supplied at the time of purchase.

WARRANTY VOID IF NOT REGISTERED

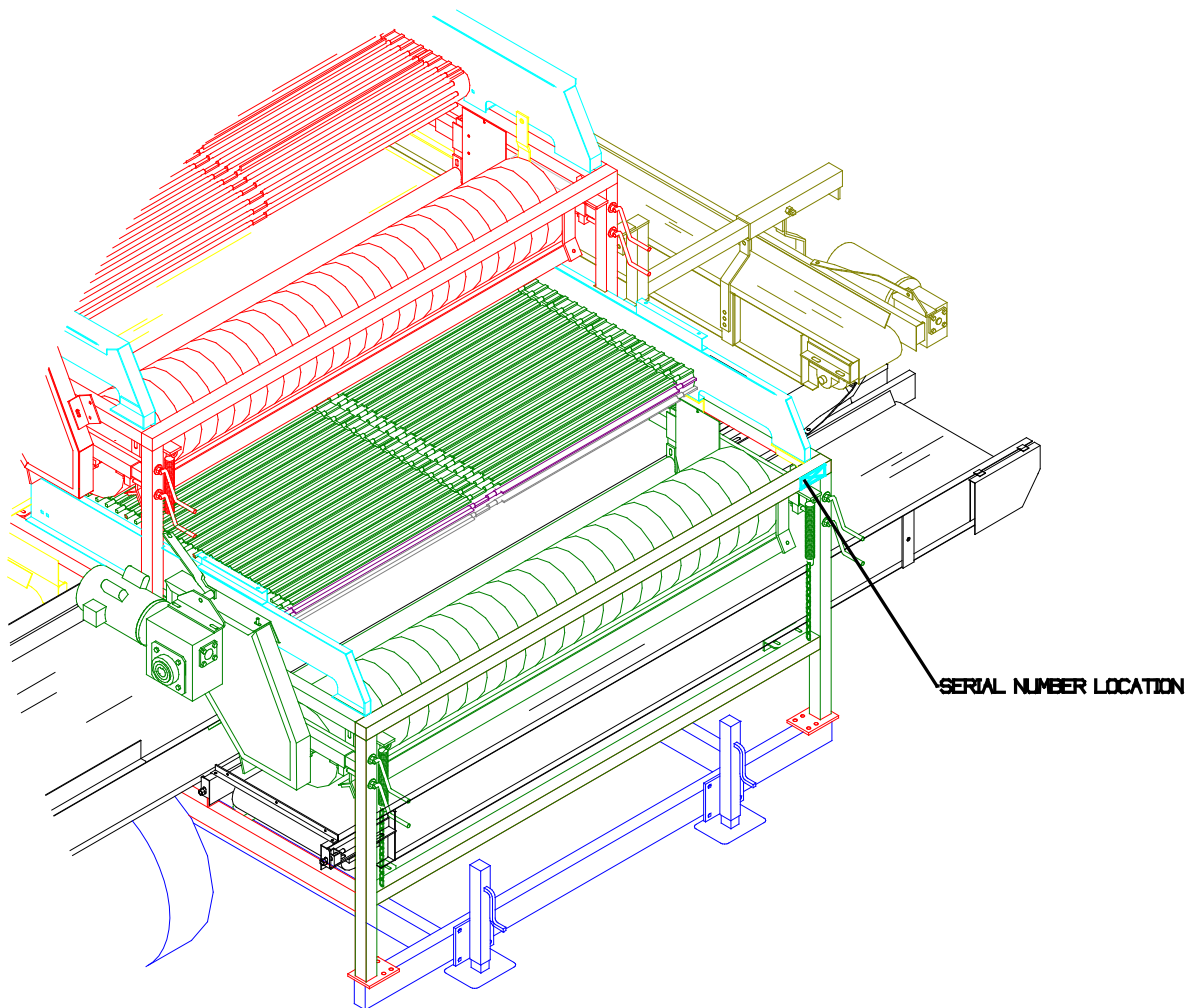
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SERIAL NUMBER LOCATION

Always give your dealer the serial number of your Harriston Potato Clod Hopper when ordering parts or requesting service or other information.

The serial number plates are located where indicated. Please mark the number in the space provided for easy reference.



Serial Number _____

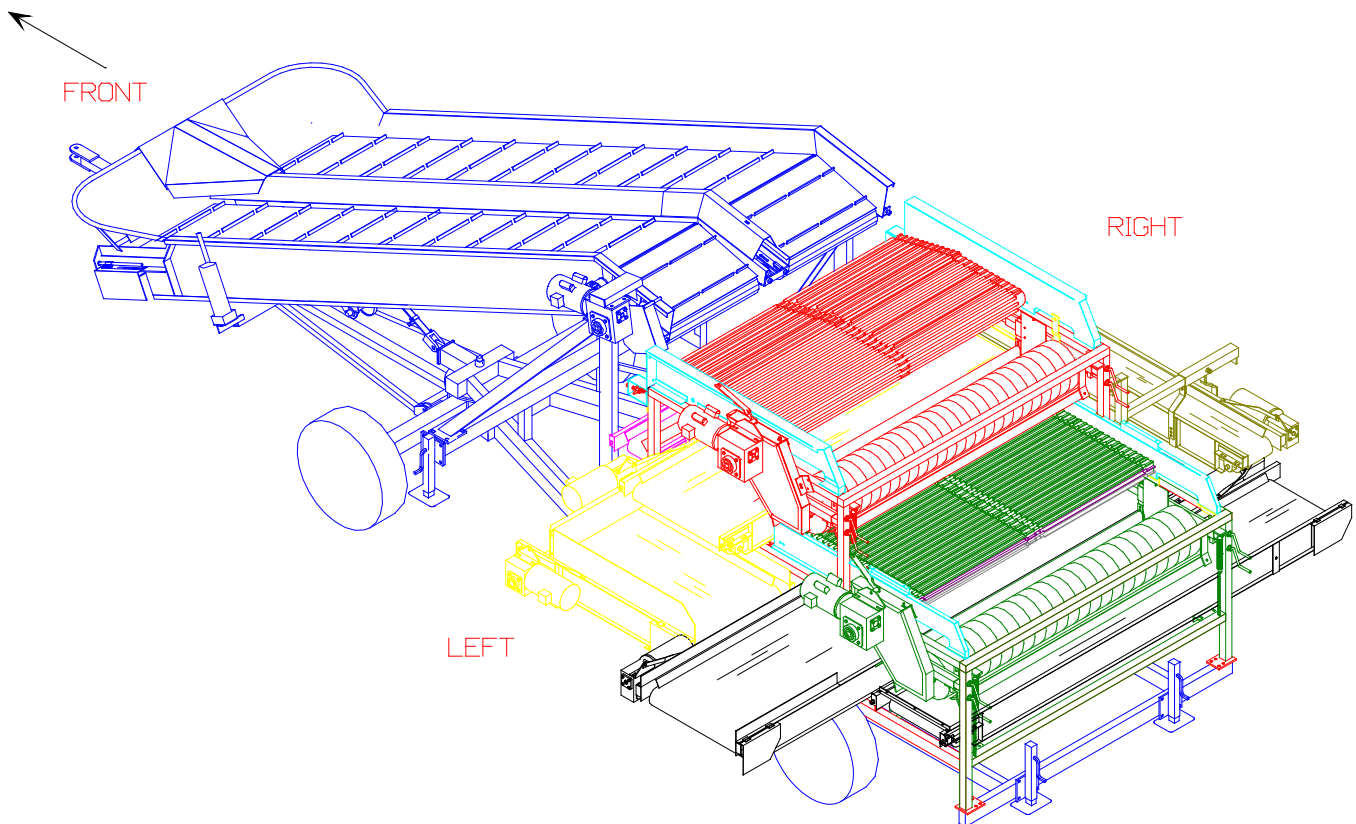
1 INTRODUCTION

Congratulations on your choice of a Harriston Clodhopper to complement your farming operation. This equipment has been designed and manufactured to meet the needs of a discerning potato industry for the efficient handling of potatoes.

Safe, efficient, and trouble-free operation of your Harriston Clodhopper requires that you and anyone else who will be operating or maintaining the Clodhopper read and understand all of the safety, operation, maintenance, and trouble shooting information contained in this Operator's Manual.

Keep this manual handy for frequent reference and to pass on to new operators and owners. Call your Harriston dealer or distributor if you need assistance, information, or additional copies of the manual.

This manual covers the Clodhopper. There are many different models and optional equipment available. Differences are explained where appropriate.



Operator Orientation - The directions left, right, front and rear, as mentioned throughout the manual, are as seen from the driver's seat and facing in the direction of travel.

2 SAFETY

SAFETY ALERT SYMBOL

This Safety Alert symbol means **ATTENTION!**
BECOME ALERT! YOUR SAFETY IS INVOLVED!

The Safety Alert symbol identifies important safety messages on the Harriston Clod Hopper and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.



Why is safety important to you?

3 Big Reasons

Accidents Disable and Kill
Accidents Cost
Accidents Can Be Avoided

SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING**, AND **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guidelines:

DANGER - An immediate and specific hazard that **WILL** result in severe personal injury or death if the proper precautions are not taken.

WARNING – A specific hazard or unsafe practice that **COULD** result in severe personal injury or death if proper precautions are not taken.

CAUTION – Unsafe practices which could result in personal injury if proper practices are not taken, or as a reminder of good safety practices.

SAFETY

YOU are responsible for the SAFE operation and maintenance of your Harriston Clod Hopper. **YOU** must ensure that you and anyone else who is going to operate, maintain, or work around the Clod Hopper be familiar with the operating and maintenance procedures and related SAFETY information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be adhered to while operating the Clod Hopper.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this equipment is familiar with the recommended operating and maintenance procedures and follows all the safety precautions. Most accidents can be prevented. Do not risk injury by ignoring good safety practices.

Clod Hopper owners must give operating instructions to operators or employees before allowing them to operate the Clod Hopper, and at least annually thereafter per OSHA (Occupational Safety and Health Administration) regulation 1928.57.

The most important safety device on this equipment is a SAFE operator. It is the operator's responsibility to read and understand ALL safety and operating instructions in the manual and to follow them. All accidents can be avoided.

A person who has not read and understood all operating and safety instructions is not qualified to operate the machine. An untrained operator exposes himself and bystanders to possible serious injury or death.

Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the equipment.

Think SAFETY! Work SAFELY!

NOTE

Have your local electrician inspect the wiring to insure that it meets state and local codes.

GENERAL SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, maintaining, or adjusting the Clod Hopper.



2. Provide a first-aid kit for use in case of an accident. Store in a highly visible place.



3. Provide a fire extinguisher for use in case of an accident. Store in a highly visible place.



4. Wear appropriate protective gear. This list includes, but is not limited to:

- A hard hat
- Protective shoes with slip-resistant soles
- Protective glasses or goggles
- Heavy gloves
- Wet weather gear
- Hearing protection
- Respirator or filter mask



5. Install and secure all guards before starting.

6. Do not allow riders.

7. Wear suitable ear protection for prolonged exposure to excessive noise.



8. Stop machine, disconnect power lines, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.

9. Use a certified electrician to provide power to the machine and to service electrical components. Clear the area of people, especially small children, before starting the unit.

10. Review safety related items annually with all personnel who will be operating or maintaining the Clod Hopper.

OPERATING SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, repairing, or unplugging.
2. Do not allow riders.
3. Install and secure all guards and shields before starting or operating.
4. Keep hands, feet, hair, and clothing away from moving parts.
5. Stop clodhopper and disconnect power supply, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
6. Use certified electrician to provide power to the machine and to service electrical components
7. Do not operate when any guards are damaged or removed.
8. Clear the area of bystanders, especially small children, before starting.
9. Keep all hydraulic lines, fittings, and couplers tight and free of leaks before using.
10. Clean Reflectors, Slow Moving Vehicle, and lights before transporting.
11. Add extra lights and use pilot vehicle when transporting during times of limited visibility.
12. Use hazard flashers on vehicle when transporting.
13. Install safety chain when attaching to towing vehicle.
14. Follow chemical manufacturers' handling and safety instructions exactly when using chemicals with machine.
15. Review safety instructions with all operators annually.

MAINTENANCE SAFETY

1. Follow all the operating, maintenance, and safety information in the manual.
2. Support the machine with blocks or safety stands when changing tires or working beneath it.
3. Stop clodhopper and disconnect power supply, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
4. Make sure all guards are in place and properly secured when maintenance work is completed.
5. Never wear ill-fitting, baggy, or frayed clothing when working around or on any of the drive system components.
6. Before applying pressure to a hydraulic system, make sure all lines, fittings, and couplers are tight and in good condition.
7. Wear appropriate protective gear when contacting chemical handling components on machine.
8. Keep hands, feet, hair, and clothing away from moving or rotating parts.
9. Clear the area of bystanders, especially small children, when carrying out any maintenance and repairs or making adjustments.

HYDRAULIC SAFETY

1. Make sure that all components in the hydraulic system are kept in good condition and are clean.
2. Replace any worn, cut, abraded, flattened, or crimped hoses and metal lines.
3. Do not attempt any makeshift repairs to the hydraulic lines, fittings, or hoses by using tape clamps, or cements. The hydraulic system operates under extremely high pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.

4. Wear proper hand and eye protection when searching for a high-pressure hydraulic leak. Use a piece of wood or cardboard as a backstop instead of hands to isolate and identify a leak.



5. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.
6. Before applying pressure to the system, make sure all components are tight and that lines, hoses, and couplings are not damaged.

TRANSPORT SAFETY

1. Make sure you are in compliance with all local regulations regarding transporting equipment on public roads and highways.
2. Make sure the SMV (Slow Moving Vehicle) emblem and all the lights and reflectors that are required by the local highway and transport authorities are in place, are clean, and can be seen clearly by all overtaking and oncoming traffic.
3. Do not allow anyone to ride on the Clod Hopper or vehicle during transport.
4. Do not exceed 32 km/h (20 mph). Reduce speed on rough roads and surfaces.
5. Make sure safety chains are attached and secure to towing vehicle while in transport.

STORAGE SAFETY

1. Store away from areas of human activity. Do not permit children to play on or around the stored machine.
2. Make sure the unit is sitting, or blocked up firm and solid and will not tip or sink into a soft area.
3. Cover with weather - proof tarpaulin and tie down securely.

TIRE SAFETY

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion, which may result in serious injury or death.
2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
3. Have a qualified tire dealer or repair service perform required tire maintenance.

ASSEMBLY SAFETY

1. Assemble in an area with sufficient space to handle the largest component and access to all sides of machine.
2. Use only lifts, cranes, jacks, and tools, with sufficient capacity for the load.
3. Use two people to handle the large bulky components.
4. Do not allow spectators in the working area.

SAFETY DECALS

1. Keep safety decals and signs clean and legible at all times.
2. Replace safety decals and signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety decals or signs are available from your Dealer Parts Department.

HOW TO INSTALL SAFETY DECALS

1. Be sure that the installation area is clean and dry
2. Decide on the exact position before you remove the backing paper.
3. Remove the smallest portion of the split backing paper.
4. Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.
5. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.
6. Small air pockets can be pierced with a pin and smoothed out using the piece of decal backing paper.

SIGN OFF FORM

Harriston Industries follows the general Safety Standards specified by the American Society of Agriculture Engineers (ASAE) and the Occupational Safety and Health Administration (OSHA). Anyone who will be operating and/or maintaining the Potato Planter must read and clearly understand All Safety, Operating, and Maintenance information presented in this manual.

Do not operate or allow anyone else to operate this equipment until such information has been reviewed. Annually review this information before the season start-up.

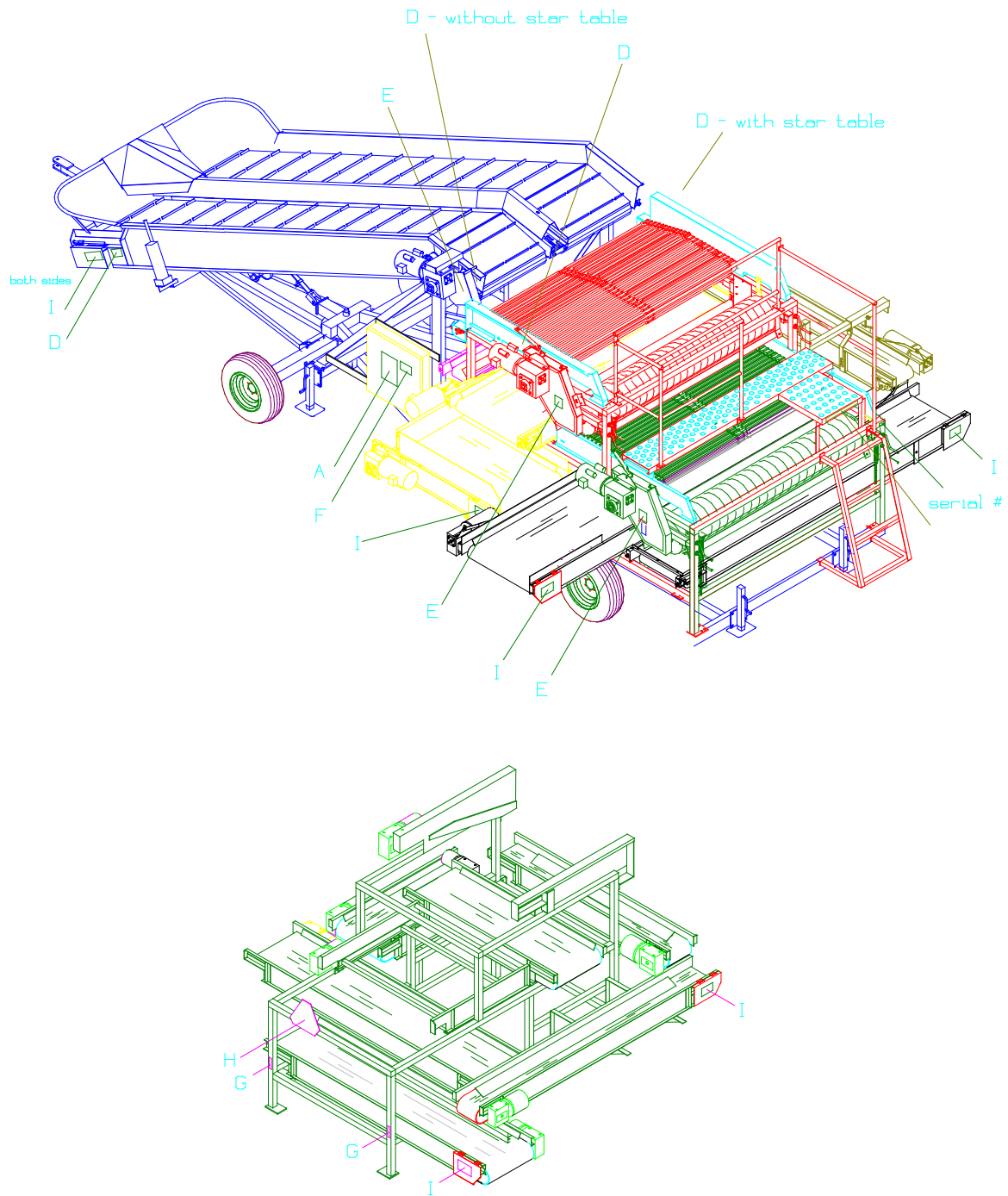
Make these periodic reviews of Safety and Operation a standard practice for all of your equipment. We feel that an untrained operator is unqualified to operate this machine.

A sign-off sheet is provided for your record keeping to show that all personnel who will be working with the equipment have read and understand the information in the Operator's Manual and have been instructed in the operation of the equipment.

SIGN – OFF FORM

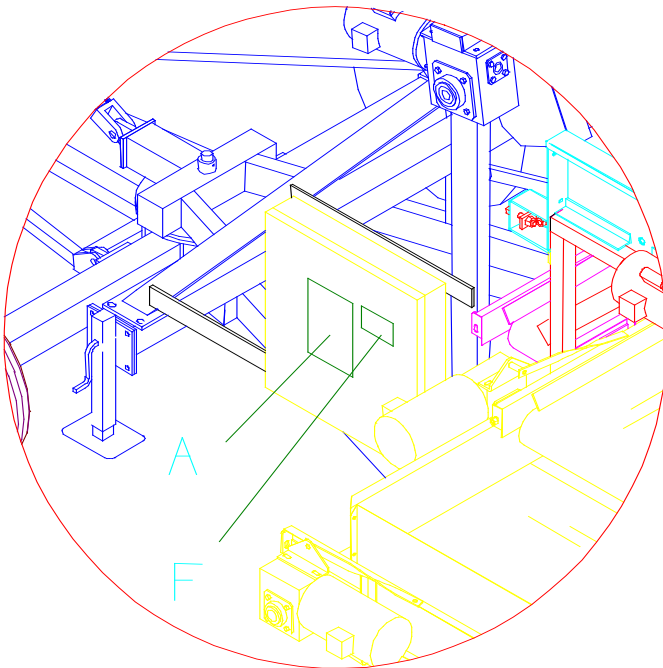
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SAFETY DECAL LOCATIONS

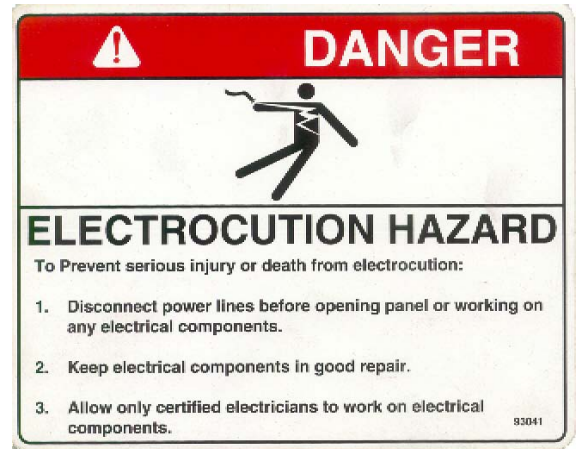


3 SAFETY DECAL LOCATIONS

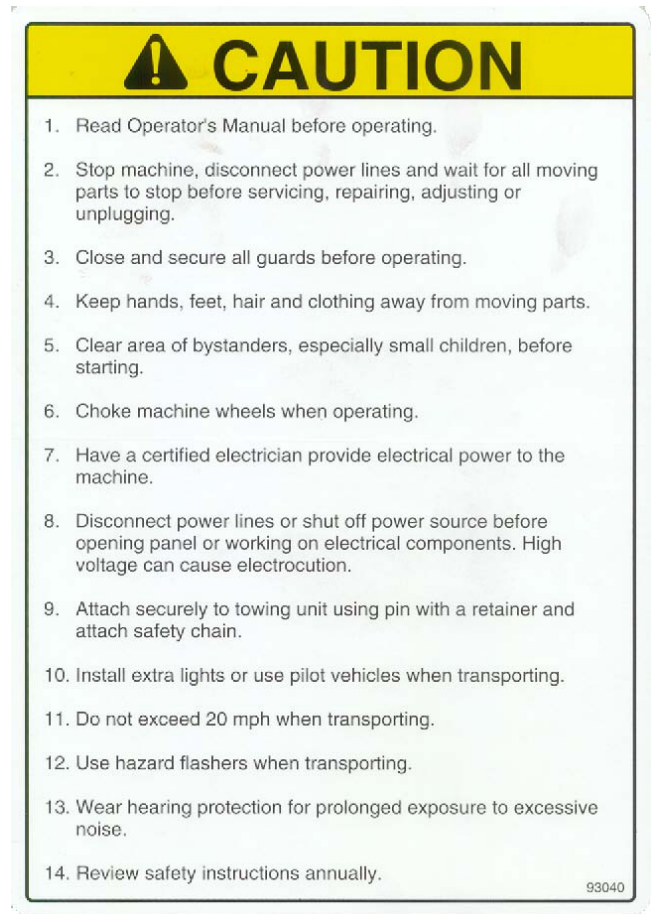
The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY .



F



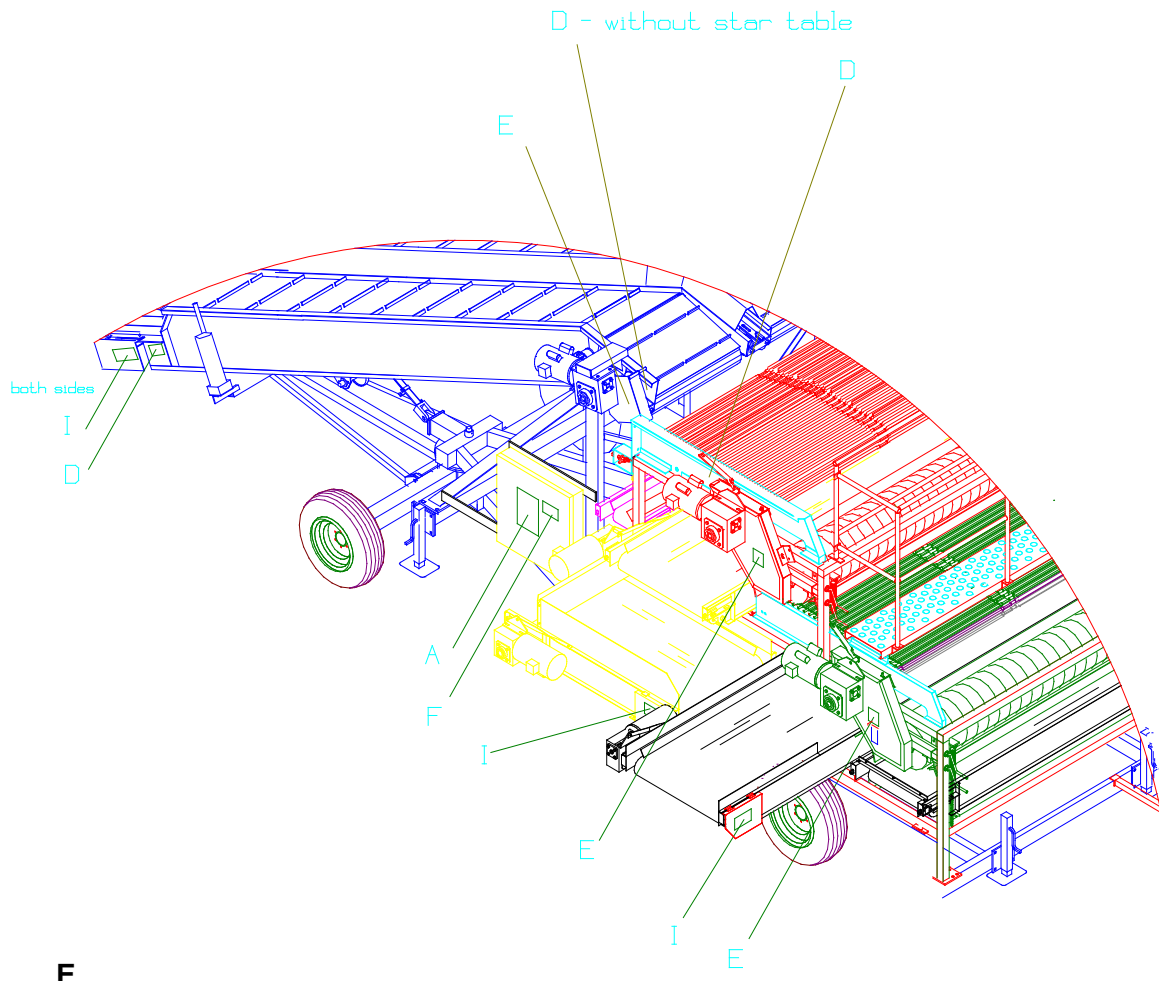
A



REMEMBER– If Safety Decals have been damaged, removed, become illegible or parts replaced with-out decals, new decals must be applied. New decals are available from your authorized dealer.

The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

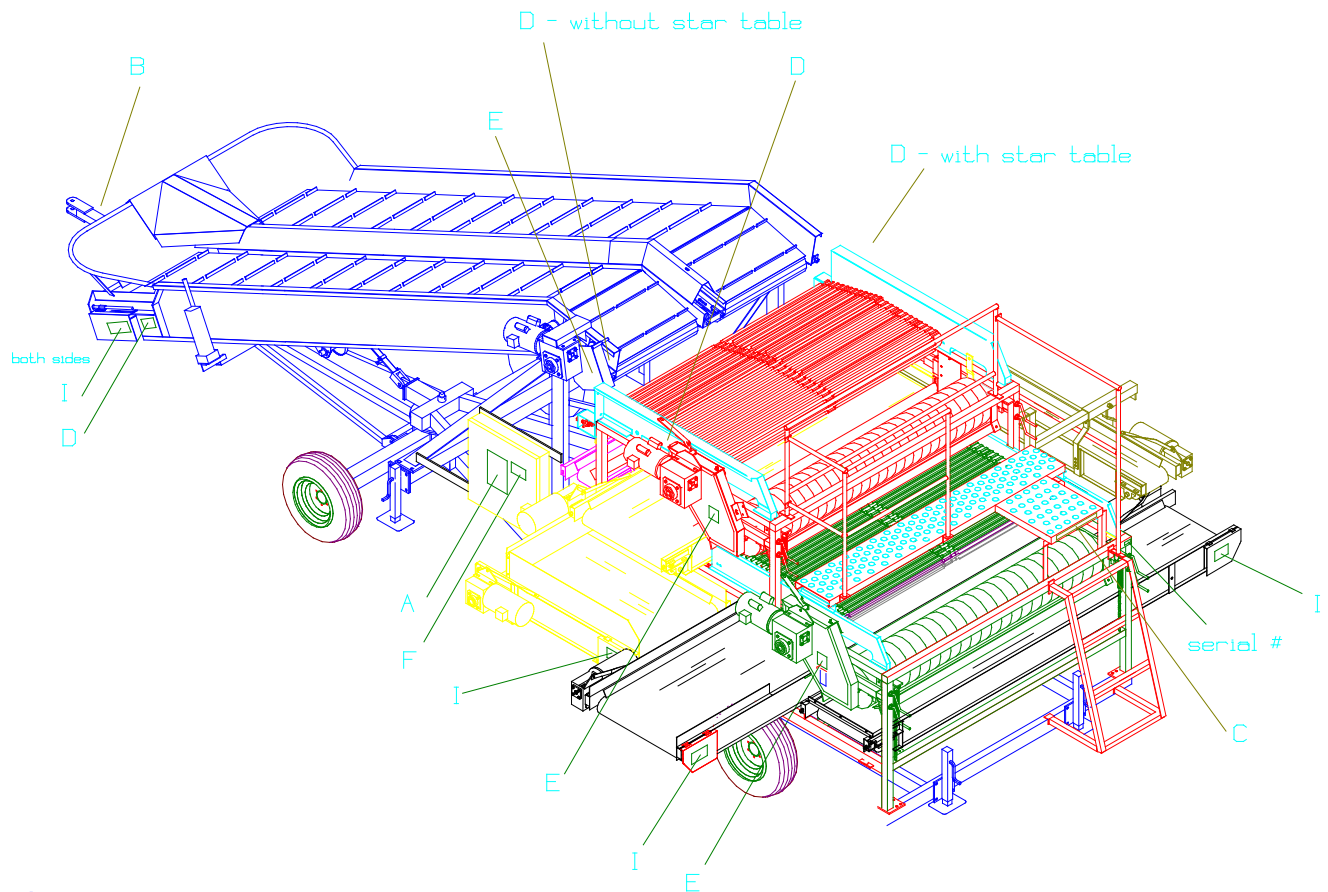
- Think SAFETY! Work SAFELY!



REMEMBER– If Safety Decals have been damaged, removed, become illegible or parts replaced without decals, new decals must be applied. New decals are available from your authorized dealer

The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS

Think SAFETY! Work SAFELY!



I



B



4 OPERATION



1. Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, repairing, or unplugging.
2. Do not allow riders.
3. Install and secure all guards and shields before starting or operating.
4. Keep hands, feet, hair, and clothing away from moving parts.
5. Stop clodhopper and disconnect power supply, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
6. Have a certified electrician provide power to the machine and service electrical components
7. Do not operate when any guards are damaged or removed.
8. Clear the area of bystanders, especially small children, before starting.
9. Keep all hydraulic lines, fittings, and couplers tight and free of leaks before using.
10. Clean Reflectors, Slow Moving Vehicle, and lights before transporting.
11. Add extra lights and use pilot vehicle when transporting during times of limited visibility.
12. Use hazard flashers on vehicle when transporting.
13. Install safety chain when attaching to towing vehicle.
14. Follow chemical manufacturers' handling and safety instructions exactly when using chemicals with machine.
15. Review safety instructions with all operators annually.

TO THE NEW OPERATOR OR OWNER

Harriston Clod Hoppers are designed to quickly and efficiently separate dirt & stones from potatoes.

It is the responsibility of the owner or operator to read this manual and to train all other operators before they start working with the machine. Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the worksite. Untrained operators are not qualified to operate the machine.

Many features incorporated into this machine are the result of suggestions made by customers like you. Read this manual carefully to learn how to operate the machine safely and how to set it to provide maximum efficiency. By following the operating instructions in conjunction with a good. Maintenance program, your Clod Hopper will provide many years of trouble-free service.

PRINCIPLE COMPONENTS

The Clod Hopper uses the difference in resiliency (bounce) between produce and clods or stones to separate the materials.

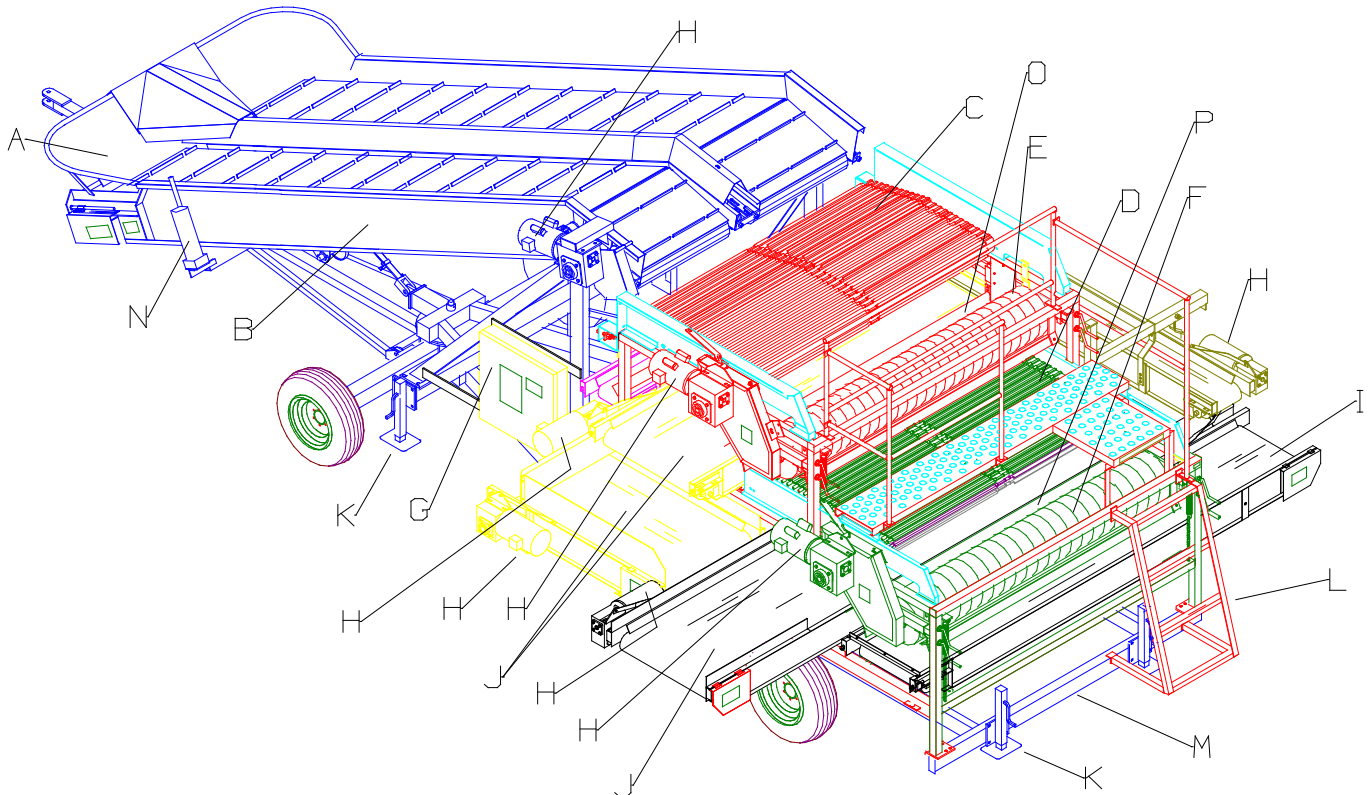
The produce from the field is loaded into the input conveyor and is moved across each of the separating rollers. As the stream of material flows over the roller, the produce will bounce further than clods, stones or other debris. A divider separates the foreign material from the produce at the impact point.

Conveyors generally move the produce to the left side of the machine and the foreign material to the right side.

Electric motors drive the machine.

The panel on the left side houses the electric controls.

Fig. 1 Principle Components.



A Elevator Loading Hopper
B Elevator Feeding Conveyor
C Primary Conveyor
D Secondary Conveyor
E Primary Roller
F Secondary Roller
G Electrical Control Panel
H Electric Drive Motors

I Trash discharge Conveyor
J Produce discharge Conveyor
K Jack Stands
L Catwalk Platform
M Transport Cart
N Hydraulic hand Pump jack
O Primary Divider
P Secondary Divider

MACHINE BREAK-IN

Although there are no operational restrictions on the Clod Hopper when used for the first time, it is recommended that the following mechanical items be checked:

A. After operating for ½ hour.

Re-torque all the wheel bolts.

Re-torque all other fasteners and hardware.

Check the alignment and tension of each conveyor. Align and tighten as required.

Check that no electric cables are pinched, rubbing or being crimped. Re-route as required.

Check the oil level in the gearboxes if there are any oil leaks.

B. After operating for 5 hours and 10 hours:

1. Re-torque all wheel bolts, fasteners and hardware.

Check electrical cable routing.

Check the tension and alignment of each conveyor.

Check all gearboxes for leaks.

Then go to the normal servicing and maintenance schedule as defined in the Maintenance Section.

PRE-OPERATION CHECKLIST

Efficient and safe operation of the Harriston Clod Hopper requires that each operator reads and understands the operating procedures and all related safety pre-operation checklist is provided for the operator. It is important for both the personal safety and maintaining the good mechanical condition of the Clod Hopper that this checklist is followed.

Before operating the machine and each time thereafter, the following areas should be checked off:

1. Service the machine per the schedule outlined in section 5 Service and Maintenance.

Be sure a certified electrician has provided power for the machine.

Check that the machine is level and supported on the frame jacks.

Clean the working area. Remove all debris and produce to prevent tripping or slipping.

Check the oil level in the gearboxes if there are any oil leaks.

Inspect all electrical cables and power lines. Re-route any that are contacting moving parts. Repair any that are damaged.

Check for and remove entangled material.

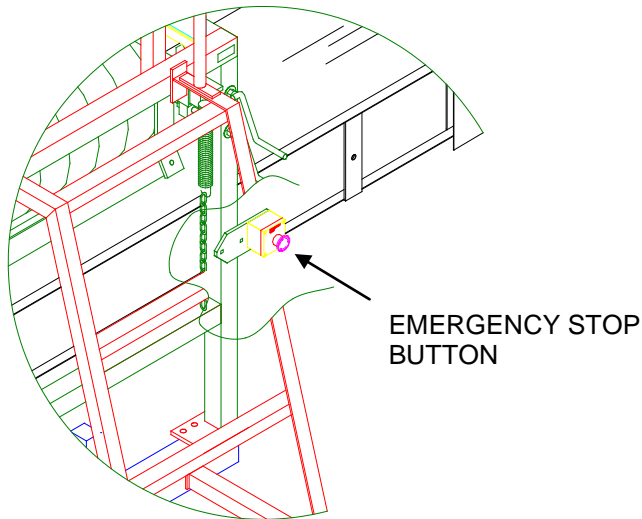
Close and secure guards.

CONTROLS

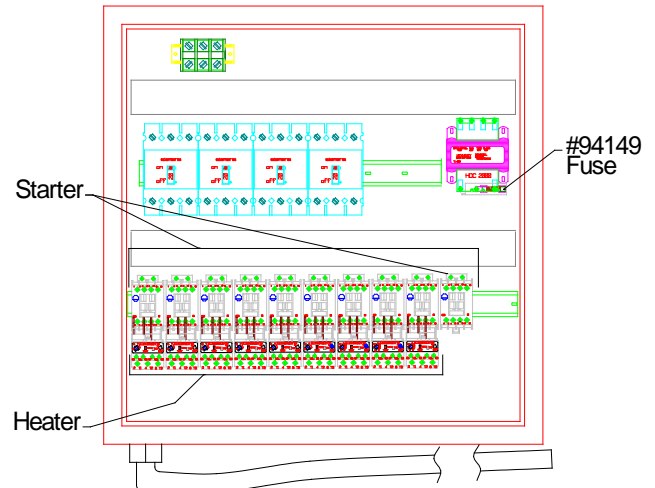
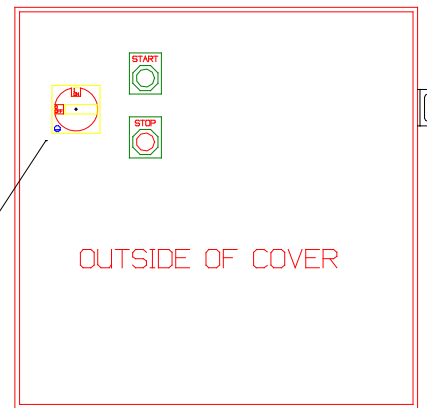
Review these sections carefully to familiarize yourself with the function and movement of each control before starting.

1. Master ON/OFF Switch

The Main Power Switch on the electrical panel must be turned to the "ON" position for other controls to function.



Master Power Switch



EMERGENCY STOP BUTTON

Push to stop entire machine.
Turn clockwise to reset switch.

2. Input Conveyor Height:

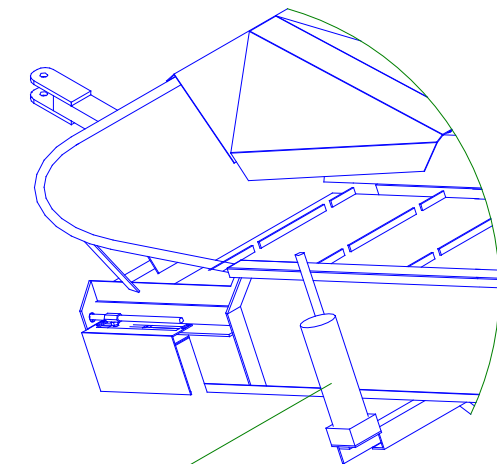
A standard hand hydraulic pump jack is used to set the height of the elevator. Close the relief valve and pump the handle to raise the elevator.

Open the relief valve lever to release pressure in pump to lower elevator.

IMPORTANT

Remove the conveyor lock rod before changing the height of the conveyor.

Electrical Control Panel



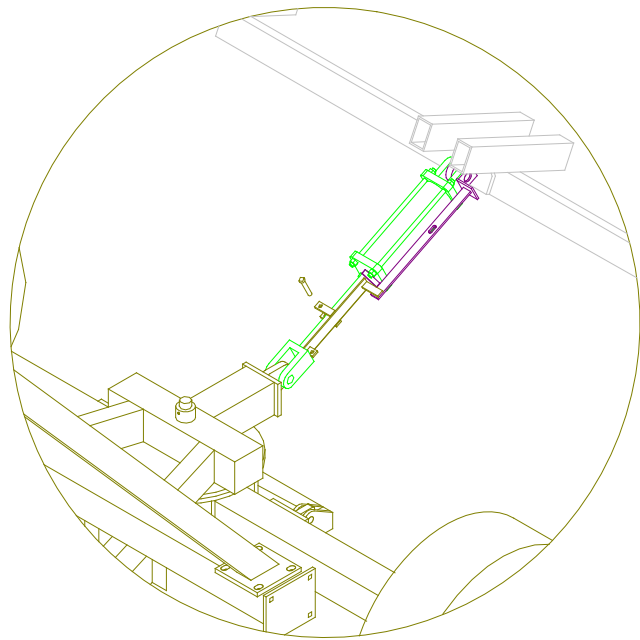
Jack

HYDRAULIC HAND PUMP

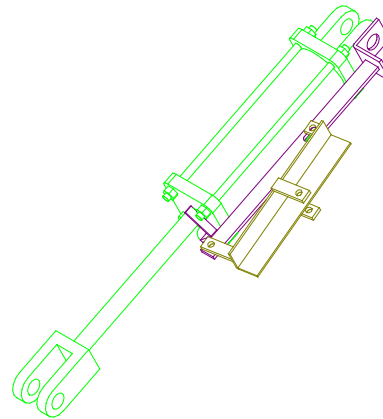
ATTACHING/UNHOOKING

The Clod Hopper should always be parked on a level, dry area that is free of debris and foreign objects. Follow this procedure when attaching.

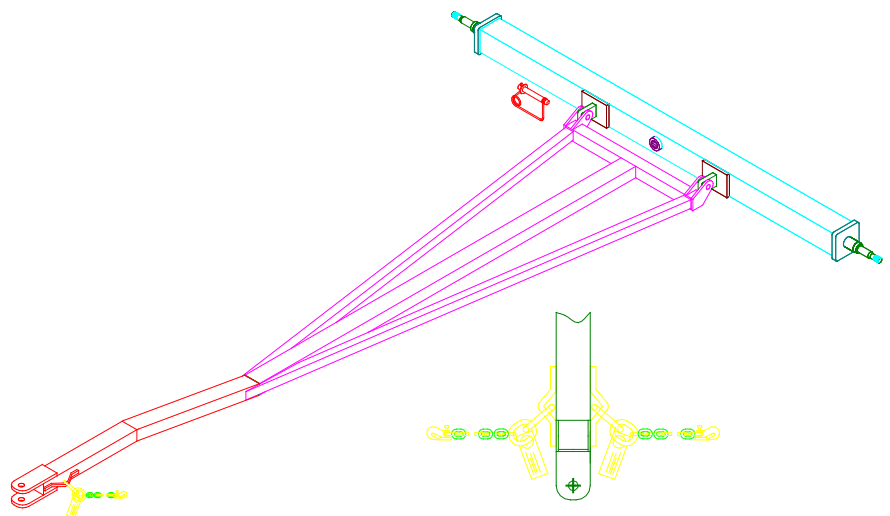
1. Clear the area of bystanders and remove foreign objects from the machine and working area.
2. Make sure there is enough room to back the towing vehicle up to the tongue.
3. Disconnect and remove the power lines.
4. Set the input conveyor at the required height and install the transport cylinder lock with its retainers.
5. If transporting on a public road, install the optional lighting bar. Secure the harness along the frame and tongue.
6. Lower the machine onto the tires. Rotate and lock the jacks into transport position.
7. Start the towing vehicle and slowly back it up to the tongue.
8. Stop the engine, place all controls in neutral, set park brake and remove ignition key before leaving cab.
9. Install a drawbar pin with provisions for a mechanical retainer such as a click pin. Install the retainer.
10. Attach the safety chain between the towing vehicle and the tongue.
11. Connect the wiring harness.
12. Reverse the above procedure when unhooking.



CYLINDER IN LOCKED POSITION



CYLINDER UNLOCKED POSITION



TOW HITCH & SAFETY CHAINS

MACHINE PLACEMENT

Before the Clod Hopper can be used it must be set up and prepared for operation. When placing, follow this procedure:

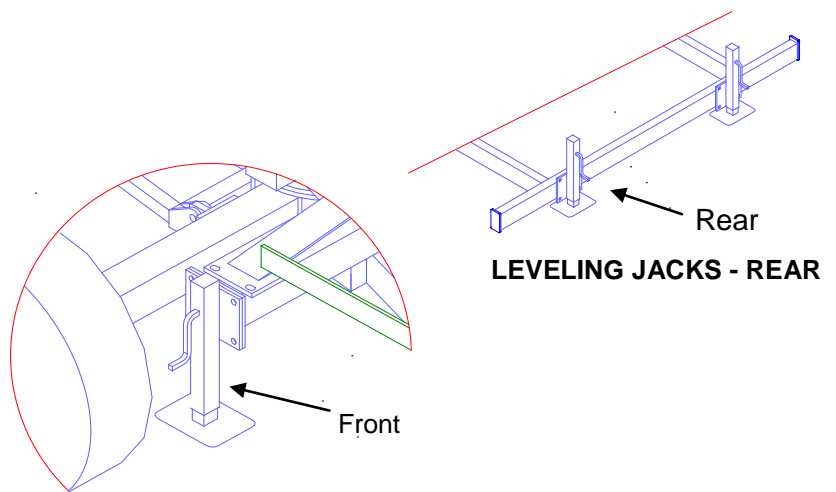
1. Clear the area of bystanders, especially small children.
2. Be sure you select a spot that has sufficient space to locate the machine, enough clearance to allow trucks to back up to unload and space for the produce and debris removal conveyors.
3. Locate the machine at the desired position.
4. Level the machine. Use the jacks to level the frame. Place blocks or planks under the base of the jack if required.
5. Remove the transport cylinder lock and place in its stowed position. Set the hopper at its desired height.
6. Move the input and removal conveyors into position.

IMPORTANT

It is recommended that a conveyor be used to move the produce from the field transport trucks into the input hopper. This also acts to distribute the flow of material evenly across the width of the machine to give you maximum capacity.

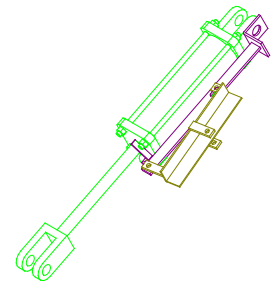
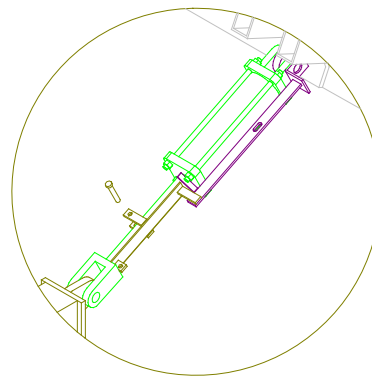
Have a certified electrician provide power to the machine. Protect the power lines to prevent damage.

Keep the working area dry and clean to prevent slipping or tripping.



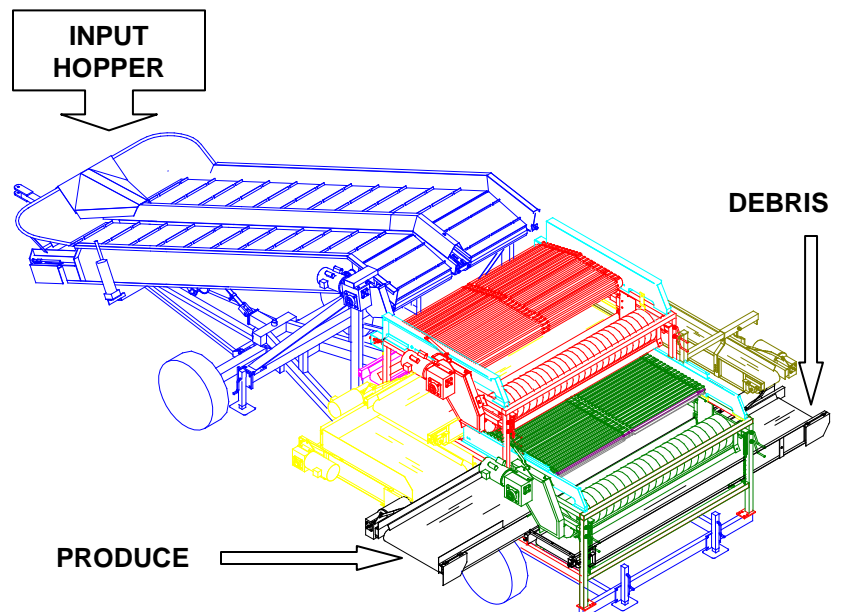
LEVELING JACKS - REAR

LEVELING JACKS - FRONT



STOWED POSITION

TRANSPORT CYLINDER LOCKED

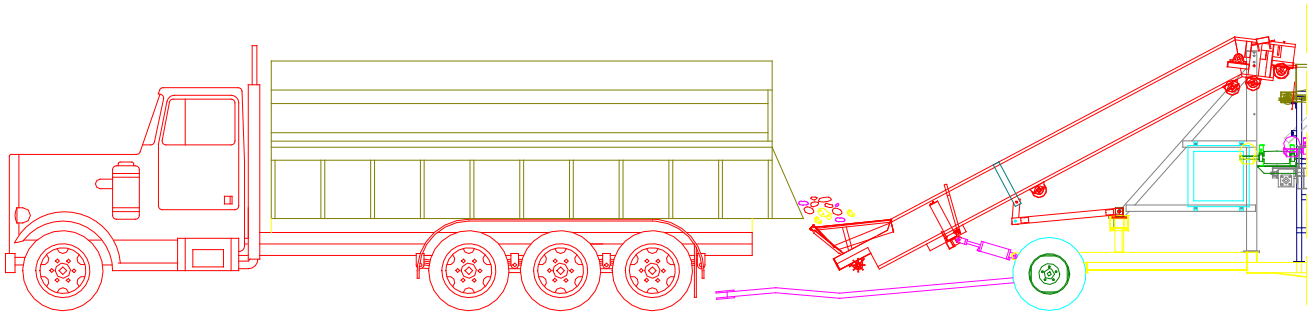


OPERATING

When operating the Clod Hopper, follow this procedure:

1. Clear the area of bystanders, especially small children, before starting.
2. Review and follow the Pre-Operation Check list.
3. Be sure the machine is correctly positioned and set-up .The trucks should have ample space and clearance to back up and unload.
4. The conveyors removing the produce and debris along with the receivers should be in place.
5. Position the truck to unload.

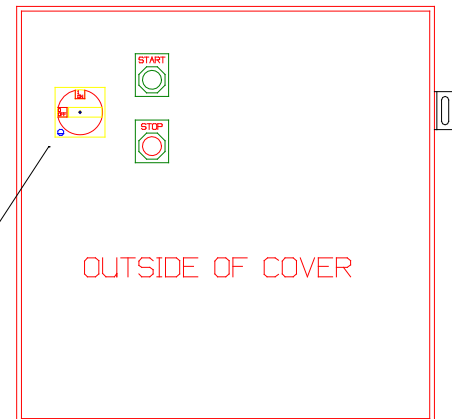
UNLOADING



Starting machine:

- a. Start the conveyors that remove the machine output.
- b. Use the master switch on the control box to turn the machine on.
- c. Push the "Start" button.
- d. Unload the truck (Refer to truck manual for details).

Master Power Switch



STOPPING MACHINE

- a. Stop the unloading of the truck.
- b. Stop the conveyor into the hopper.
- c. Stop the machine using the "Stop" button.
- d. Stop the conveyors removing material from the machine.

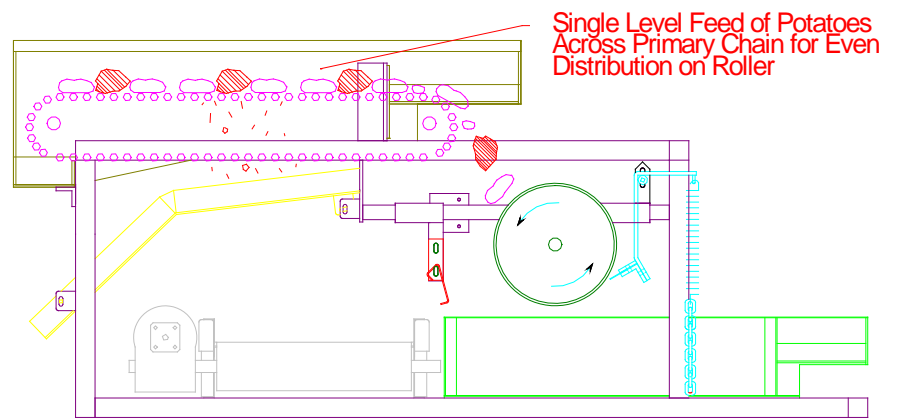
NOTE

It is best if the machine and conveyors are empty before stopping the machine and cleaning system.

MAXIMUM CAPACITY:

To obtain maximum capacity, the operating conditions should exist:

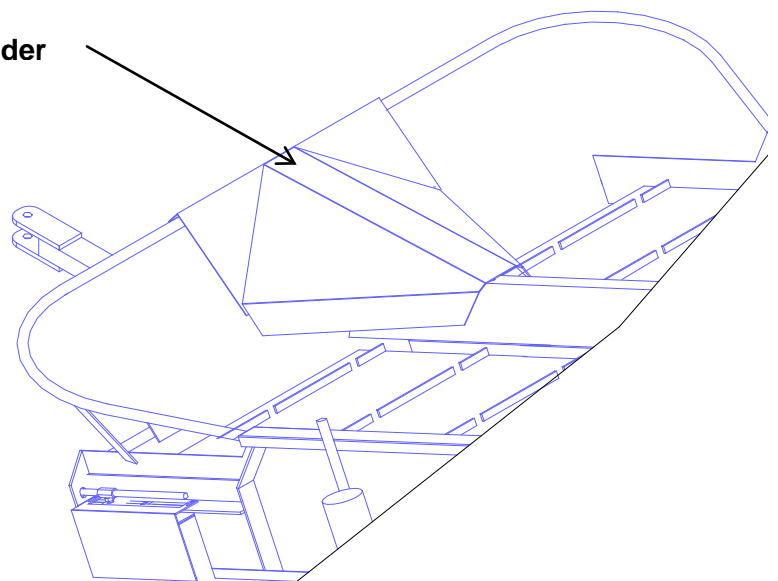
- a. Feed the machine with a single layer of material. This will allow each piece of produce to contact the roller and rebound off. The difference in the distance of the bounce between produce and foreign material will separate the materials.



SINGLE LAYER FEEDING

- b. Distribute the flow of material evenly across the width of the machine and keep it full. Use the divider in hopper to spread the flow of material.

Divider



DIVIDER

Machine settings:

The machine operates on the principle that produce will bounce farther than clods, stones and debris. Separation takes place at the divider where everything rebounds off the roller. For this to perform as intended, the geometry of the machine must be properly set.

a. Roller Position

Set the position of the rollers so the stream of material strikes each roller at the 10:00 to 10:30 position. Watch the flow of material. Move the rollers away from the conveyor when the produce is large. Move closer when small. Always maintain the roller impact point.

b. Adjusting of the Clod Hopper

Level the Clod Hopper side to side. The input end should be slightly lower than the roller end

Potatoes should generally feed over the first stage in a single layer; however, when the Clod Hopper is working at capacity, there will occasionally be potatoes riding on potatoes.

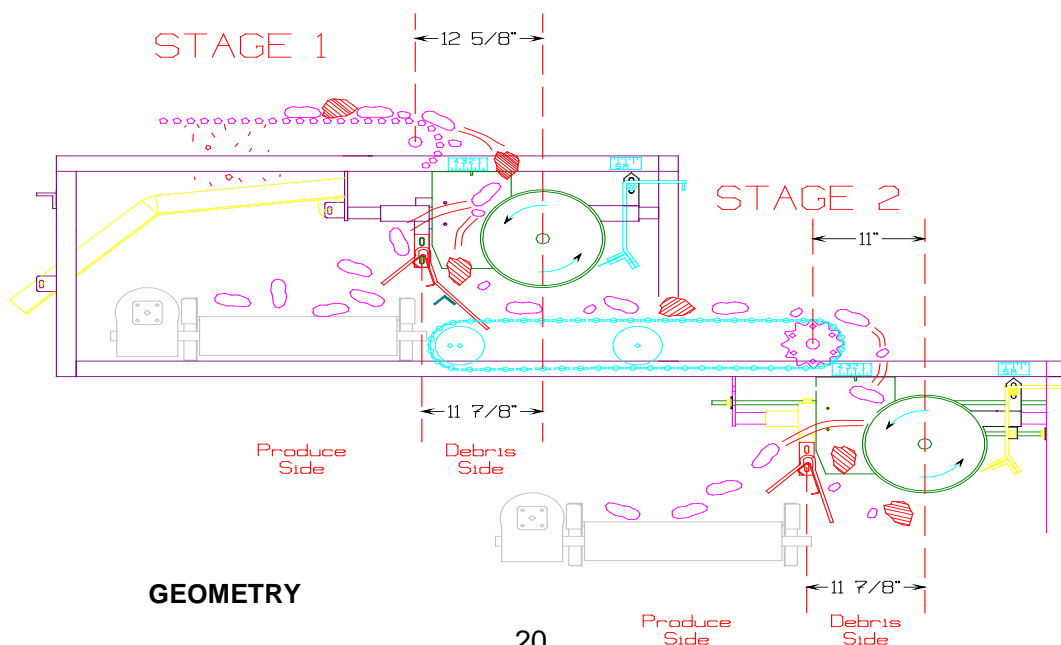
An occasional stone or clod going with the potatoes in the first stage is acceptable; if there are none, adjust the divider to decrease the distance from the roller.

On the second stage, adjust the divider so that one person can handle separating potatoes from the tare.

Start the Roller in the Med. Position for both stages.
Start the Divider at the #2 position for both stages.

THE THREE MOST COMMON CAUSES RELATING TO POOR SEPARATION

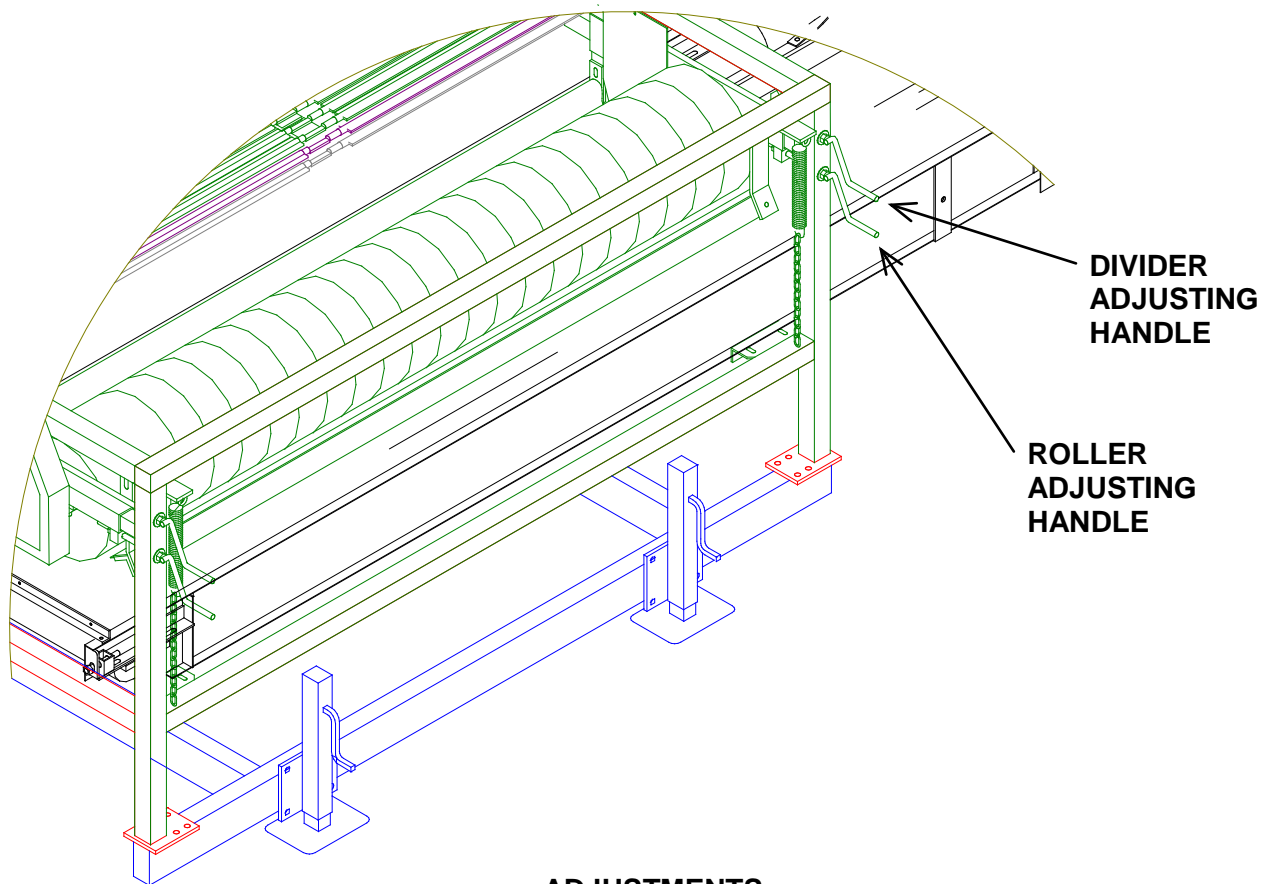
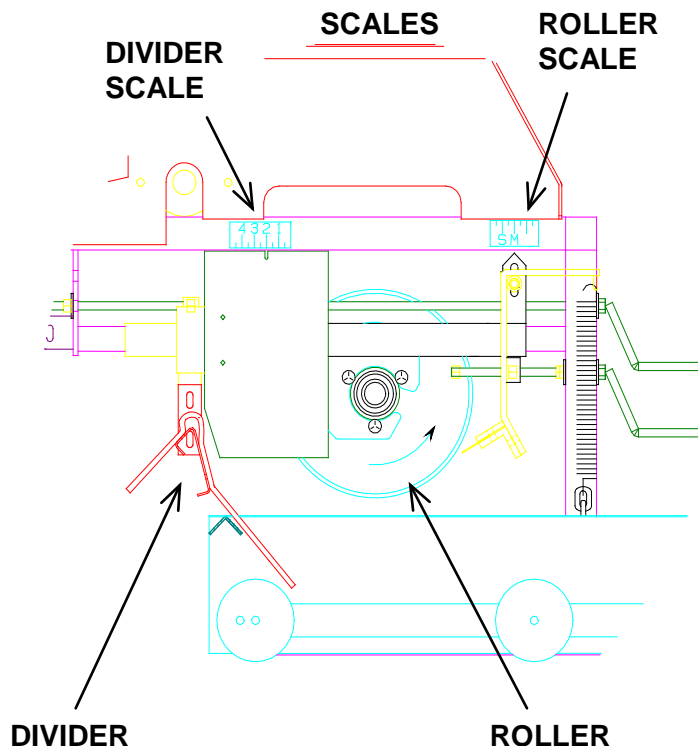
1. FEEDING PRODUCE TO THE FIRST STAGE ROLLER IN MORE THAN ONE LAYER.
2. SETTING THE ROLLER TOO CLOSE TO THE CONVEYOR CHAIN ON BOTH FIRST AND SECOND STAGES.
3. SETTING THE DIVIDER TOO CLOSE TO THE ROLLER.



- c. **Divider position:** Set the dividers so that the clean produce falls on the clean produce conveyor and the trash falls in the debris conveyor. Watch the rebound area. There will be a definite separating line between the produce and the trash. Watch the flow of material as it rebounds off the roller and set the divider to separate the trash from the produce.

IMPORTANT

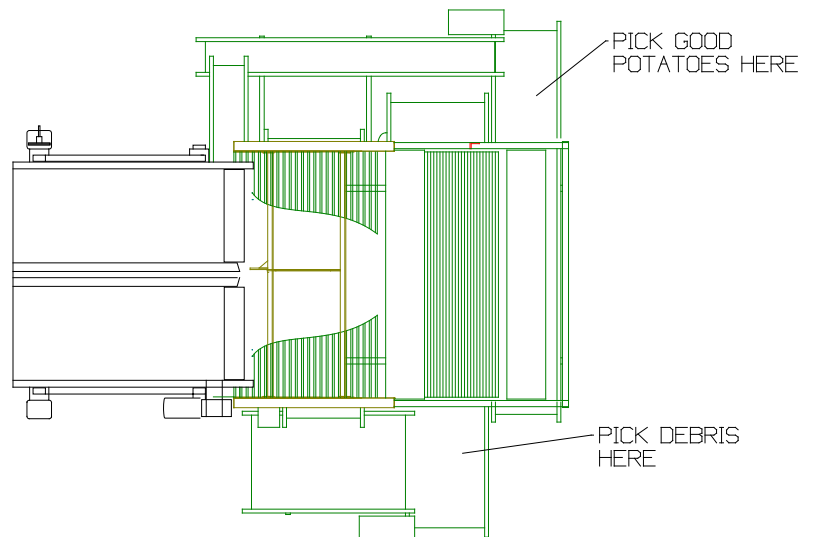
Set the machine so 90% to 95% of the trash is removed at Stage 1.



**ADJUSTMENTS
CLEANING COMPONENTS (TYPICAL)**

Machine settings:

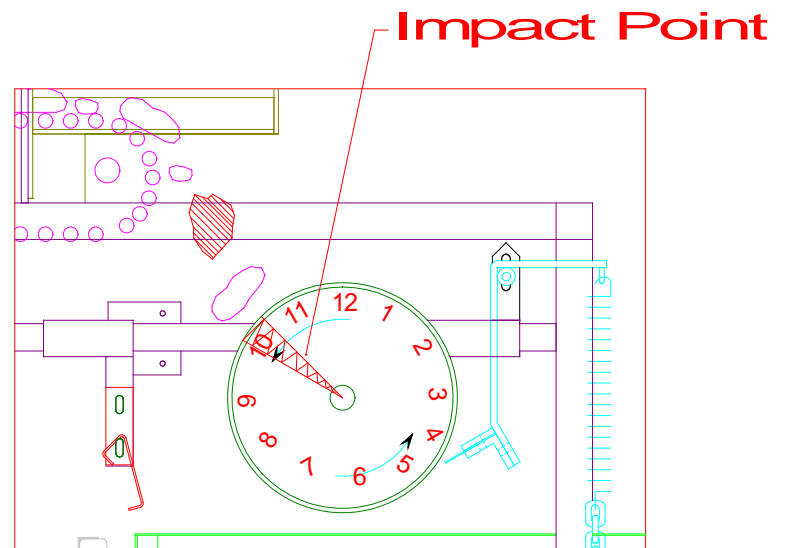
A final picker can stand next to the conveyor at each of the rear corners to inspect and pick out the final pieces. Do not wear loose tattered clothing when working at those positions.



Operating hints:

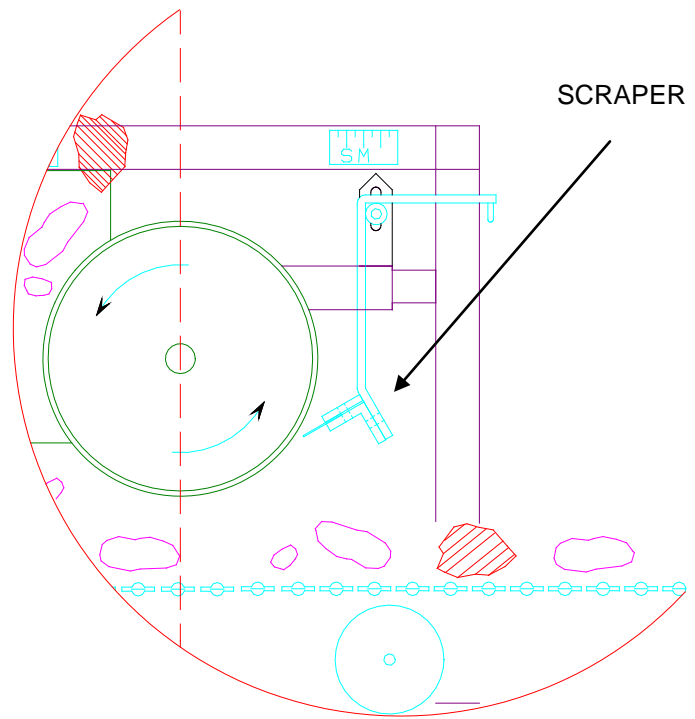
- a. Provide a steady flow of material through the machine at all times. Adjacent produce acts as a cushion and reduces bruising.
- b. Distribute the flow of material evenly across the width of the machine to obtain maximum capacity. Use the divider in the hopper to distribute the flow.
- c. Set the rollers so the flow of material strikes the 10:00 to 10:30 position. This will give the optimum rebound angle.
- d. Use the dividers to separate the produce from the trash at the rebound angle.

PICKER POSITIONS

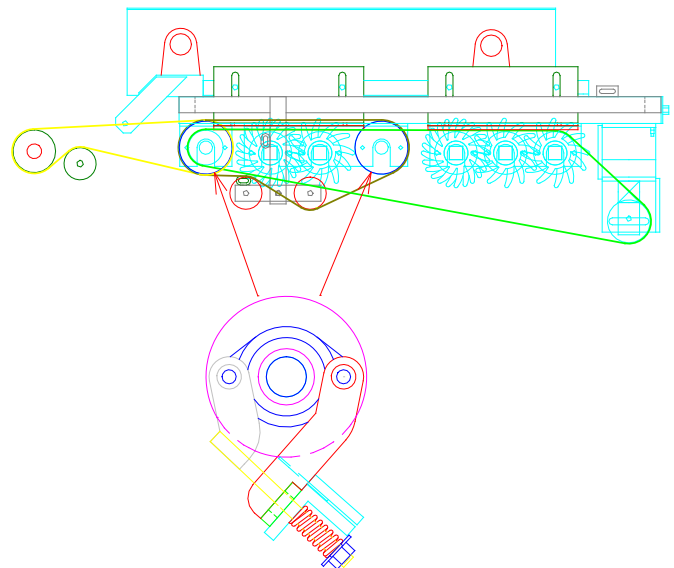


FEEDING

- e. In wet conditions, mud and debris can stick to the rollers and affect the produce rebound. Increase the force on the roller scrapers or clean the rollers when they get dirty. If conditions are such that the scrapers are not needed, keep spring pressure to a minimum to reduce wear on rollers.



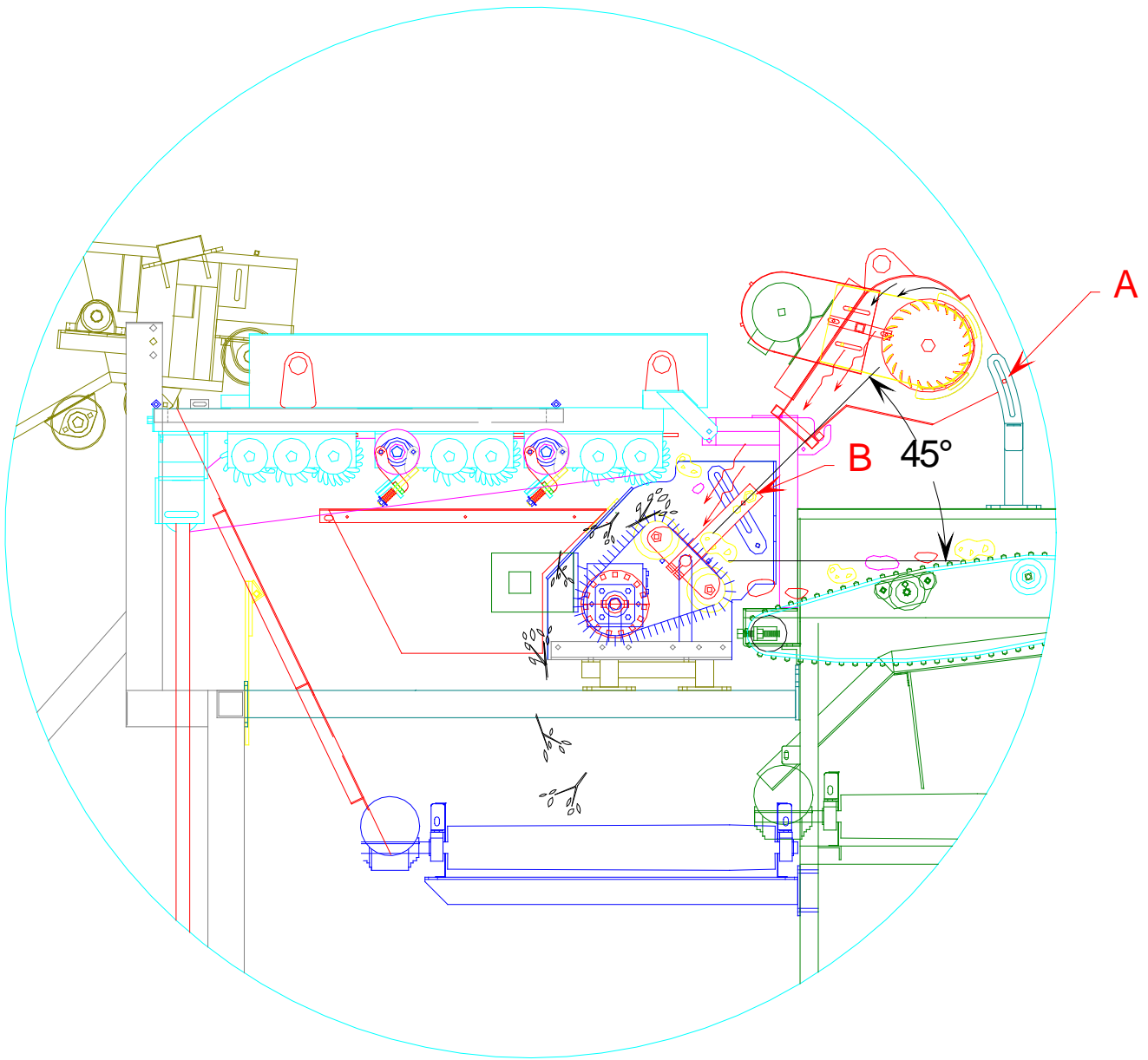
- f. Use conveyors to load material into the hopper and to remove produce and trash at the outputs.
- g. Keep the working area clean and dry to prevent tripping or slipping.
- h. Keep scrapers on tables properly adjusted and clear of debris. Clean when necessary.



SS TABLE SCRAPER



Stop machine, disconnect power lines, and wait for all moving parts to stop before attempting to clean rollers.



PEG BELT / BLOWER ADJUSTMENTS

Blower angle is adjustable at "A". It should blow vines into the flat surface of the peg belt. Angle of Peg Belt is adjusted by rotating handle "B". Initial setting should be approx. 45°. If potatoes are being carried with vines onto tare conveyor, move handle down to increase angle of belt surface.

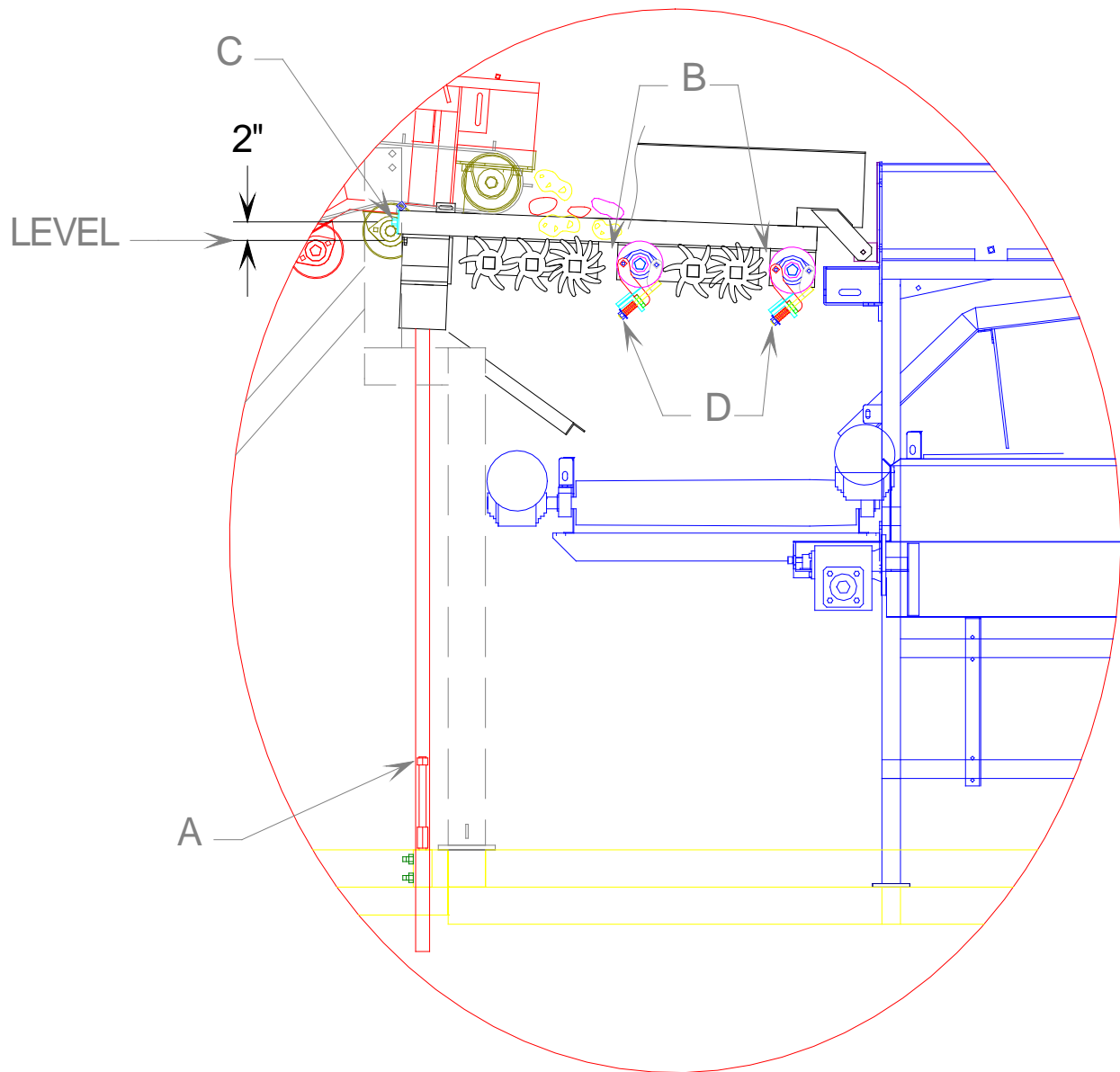


TABLE ADJUSTMENTS

Adjust pitch of table by turning adjusting screws on lower parts of table uprights (A). Adjust table 2" higher than level at the front (input) as a starting point. For more aggressive cleaning, lower the front of the table to slow movement of produce. Adjust the star roller shaft clearance (B) by turning the hex shafts (C). **ADJUST BOTH SIDES EVENLY!** More clearance will allow small potatoes & larger dirt lumps to be eliminated. Tighten scraper (D) to increase pressure on rollers. Periodic manual cleaning of rollers may be needed in certain soil conditions. **STOP MACHINE & UNPLUG MAIN POWER CORD BEFORE CLEANING ROLLERS.**

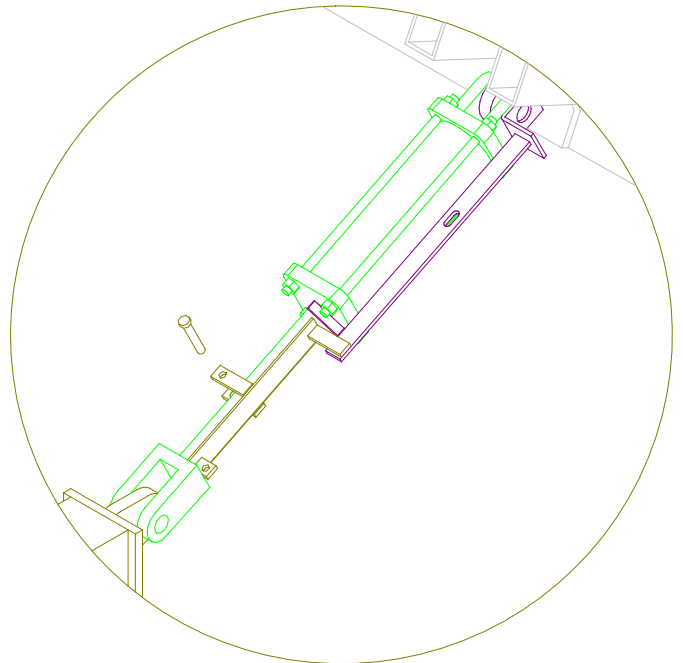


TRANSPORT SAFETY

1. Make sure you are in compliance with all local regulations regarding transporting equipment on public roads and highways.
2. Make sure the SMV (Slow Moving Vehicle) emblem and all the lights and reflectors that are required by the local highway and transport authorities are in place.
3. Attach securely to the towing vehicle using a retainer on the pin and the safety chains.
4. Do not allow anyone to ride on the machine during transport.
5. Install and secure input conveyor lock rod before transporting.
6. Do not exceed 20 mph (32 km/h). Reduce speed on rough roads and surfaces.
7. Always use hazard-warning flashers on towing vehicle when transporting unless prohibited by law.
8. Add extra lights or use pilot vehicles when transporting.

The Harriston Clod Hopper is designed to be easily and conveniently moved from location to location. When transporting, follow this procedure:

1. Be sure all bystanders are clear of the machine.
2. Be sure that the Clod Hopper is hitched positively to the towing vehicle. Always use a retainer in the pin and attach the safety chain between the machine and the towing vehicle.
3. Install the transport lock rod on the input conveyor cylinder. Use retainers.



4. Install and connect the optional lighting package.
5. Keep to the right and yield the right of way to allow faster traffic to pass. Drive on the road shoulder, if permitted by law.
6. Make sure the SMV (Slow Moving Vehicle) emblem and the lights and reflectors that are required by the local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.
7. It is not recommended that the machine be transported faster than 20 mph (32 km/h). Table 1 gives the acceptable transport speed as the ratio of towing vehicle weight to machine weight.
8. Do not allow riders on the machine.
9. During periods of limited visibility, use pilot vehicles and add extra lights to the machine.
10. Always use hazard flashers on the towing vehicle when transporting unless prohibited by law.

Speed vs. Weight Ra-

Road Speed	Weight of fully equipped or loaded implement(s) relative to weight of towing machine
Up to 32 km/h (20 mph)	1 to 1 or less
Up to 16 km/h (10 mph)	2 to 1, or less
Do not tow	More than 2 to 1



STORAGE SAFETY

1. Store the unit in an area away from human activity.
2. Do not permit children to play on or around the stored machine.
3. Store the unit in a dry, level area. Support the base with planks if required.

At the end of the season, the machine should be thoroughly inspected and prepared for storage. Repair or replace any worn or damaged components to prevent any unnecessary down time at the start of next season. Follow this procedure:

1. Wash the entire machine thoroughly using a pressure washer to remove all dirt, mud, debris or residue.
2. Apply a light coating of oil to each roller chain to prevent rusting.
3. Lubricate all grease points.
4. Inspect all electrical lines. Repair or replace any damaged cable.
5. Check all gearboxes for leaks. Repair if necessary.
6. Run the machine for a couple of minutes to dry it from the washing and to distribute the oil over the roller chain.
7. Disconnect and store the power lines inside.
8. Touch up all paint nicks and scratches to prevent rusting.
9. Move the machine to its storage position.
10. Select an area that is dry, level and free of debris.
11. Unhook the machine from the towing vehicle (Refer to Section 4.7).
12. If the machine cannot be stored inside, cover with a waterproof tarpaulin and tie securely in place.
13. Store out of the way of human activity.
14. Do not allow children to play around unit.

5 SERVICE AND MAINTENANCE



1. Follow ALL the operating, maintenance and safety information in the manual.
2. Support the machine with blocks or safety stands when changing tires or working beneath it.
3. Follow good shop practices:
 - Keep service area clean and dry. Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
4. Use only tools, jacks and hoists of sufficient capacity for the job.
5. Stop machine, disconnect power lines and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
6. Make sure all guards are in place and properly secured when maintenance work is completed.
7. Keep hands, feet, hair and clothing away from all moving and/or rotating parts.
8. Clear the area of bystanders, especially small children, when carrying out any adjustments.

SERVICE

FLUIDS AND LUBRICANTS

1. Grease
Use SAE multi-purpose high temperature grease with extreme pressure (EP) performance. Also acceptable is SAE multi-purpose lithium based grease.
2. Gearbox Oil
Refer to EPT manual
3. Storing Lubricants
Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture and other contaminants.

GREASING

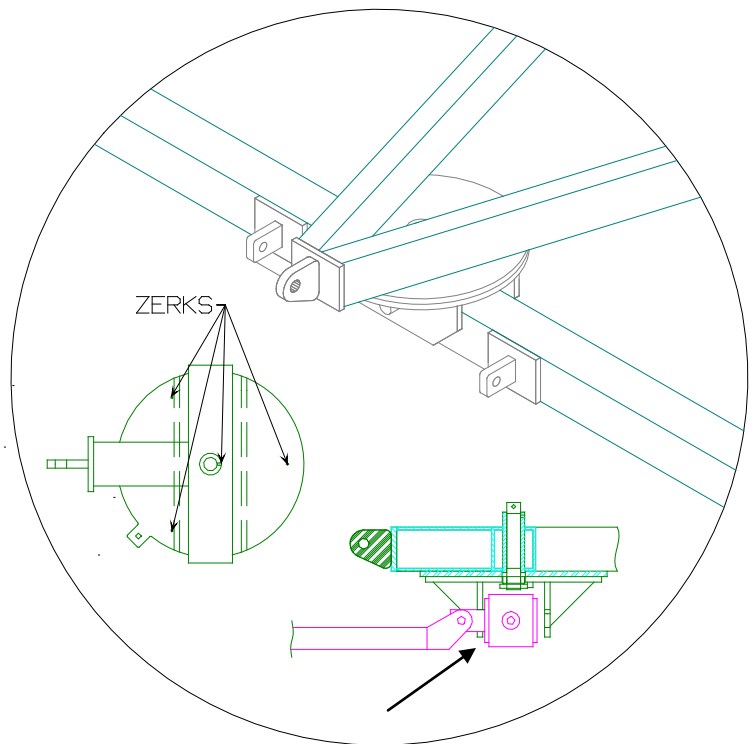
Refer to Section Fluids and Lubricants for recommended grease. Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use a hand-held grease gun for all greasing.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If fittings will not take grease, remove and clean thoroughly. Also clean lubricant passageway. Replace fitting if necessary.

SERVICING INTERVALS

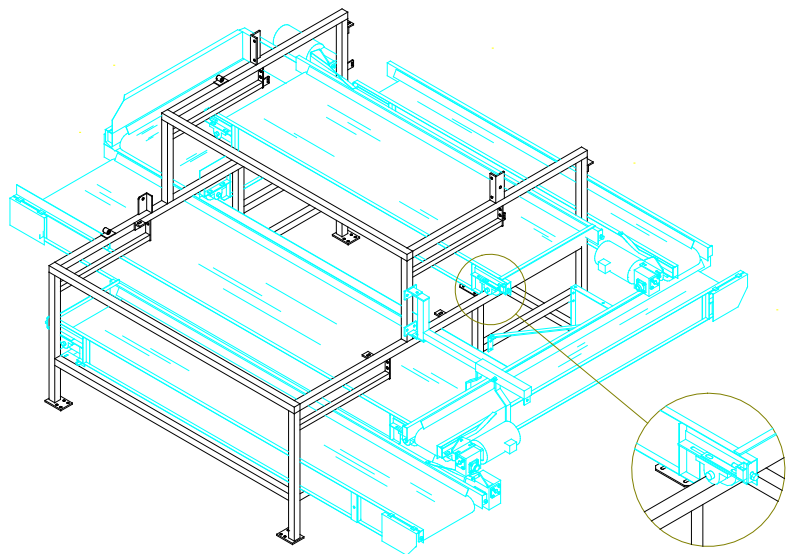
Monthly

1. Lubricate the front swivel castor base and pivot bushings. (5 locations).



FRONT SWIVEL GREASE POINTS

2. Check the tension and alignment of the conveyors.

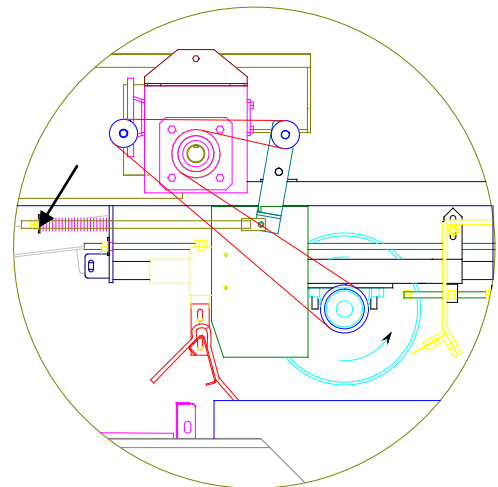


CONVEYOR TIGHTENER (TYPICAL)

3. Check the tension and alignment of the roller chains and sprockets.

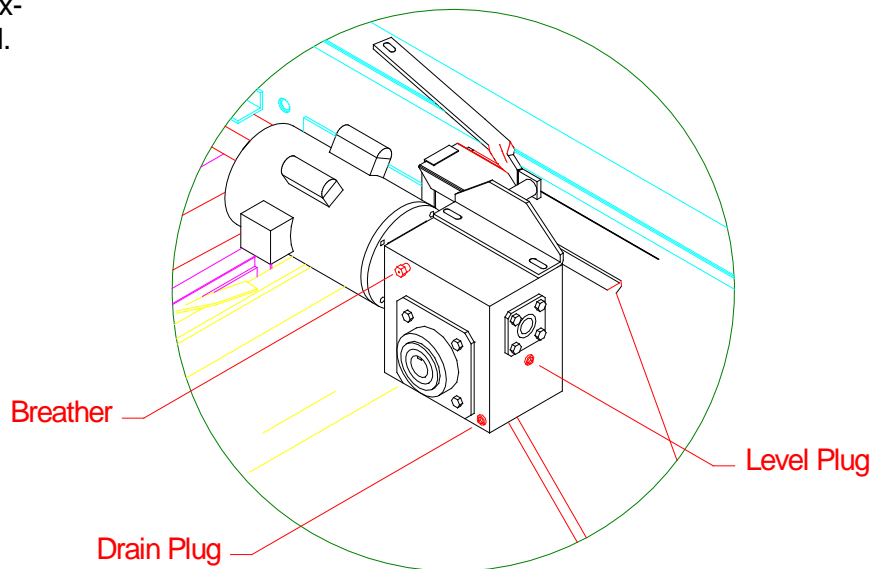


Machine is shown with guard opened for illustrative purposes only. Do not operate machine with guard opened.



ROLLER CHAIN

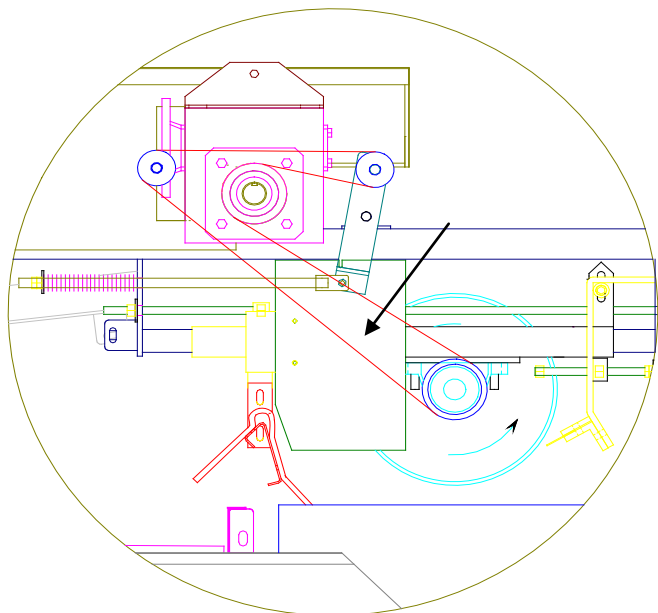
4. Check the oil level in the gearboxes (9 locations). Add as required.



**GEAR BOX LEVEL PLUGS
(TYPICAL BROWNING ONLY)**

Annually or 500 Hours

1. Wash machine.
2. Change oil in gearboxes (Browning gearboxes only).
3. Apply a light coat of oil to roller chain before storage.



ROLLER CHAIN (TYPICAL)



WARNING

Machine is shown with guard opened for illustrative purposes only. Do not operate machine with guard opened.

SERVICE RECORD

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

ACTION CODE

CHECK ✓
LUBRICATE L

CL CLEAN
C CHANGE

[illegible]

MAINTENANCE

By following a careful service and maintenance program for your machine, you will enjoy many years of trouble-free service

CONVEYOR TENSION AND ALIGNMENT

Material is moved through the machine on belt conveyors and a potato chain. To obtain efficient transmission of material and good life, the belts and chain must be properly tensioned and the rollers and sprockets aligned.

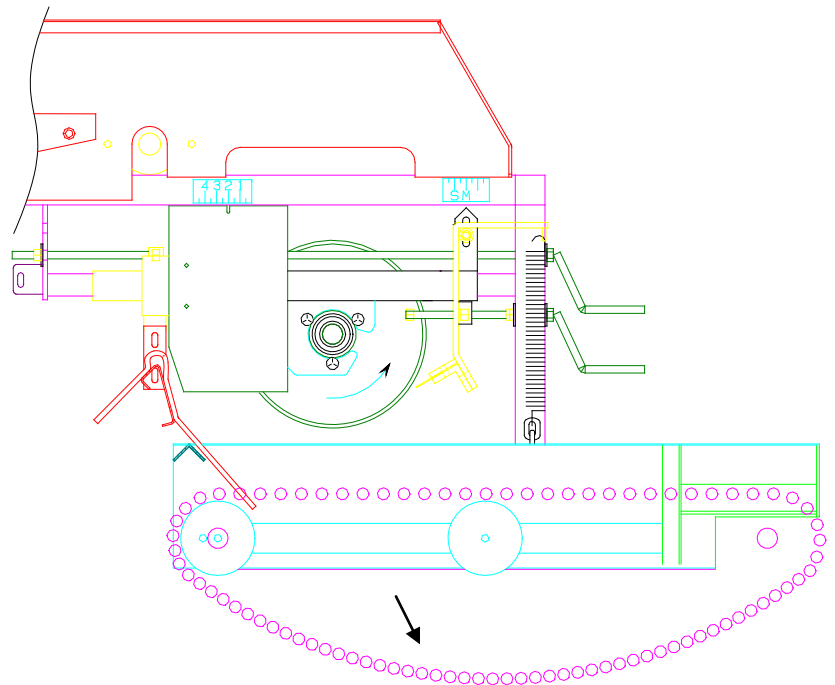
Belts that are too tight will stretch and wear quickly or overload the bearings. Belts that are too loose will catch on the frame and wear quickly. Drive rollers that are not aligned will result in rapid belt wear.

Follow this procedure when checking and adjusting belt tension and roller alignment:

1. Clear the area of bystanders especially small children machine.
2. Stop machine, disconnect power lines and wait for all moving parts to stop before maintaining machine.
3. The secondary chain is properly tensioned when it sags slightly on the bottom side but does not drag or catch on the frame. The secondary conveyor should sag on the loose side. If the drive roller or sprocket slips, the conveyor needs to be tightened.



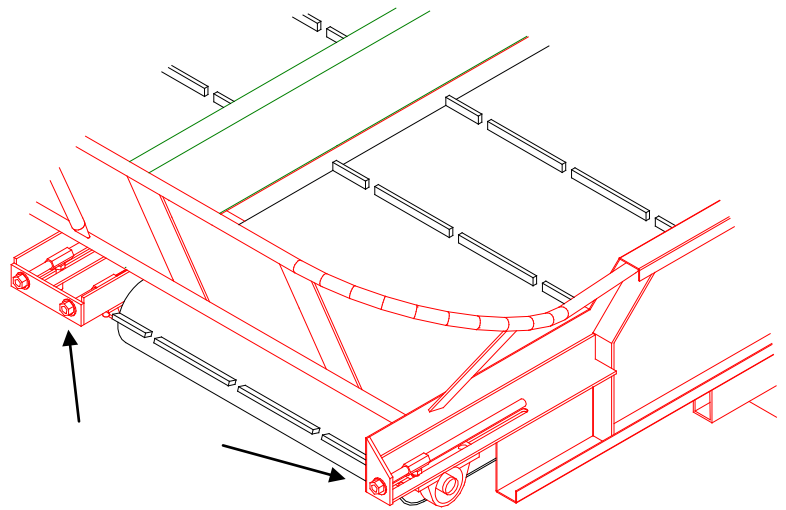
Machine is shown with guard opened for illustrative purposes only. Do not operate machine with guard opened.



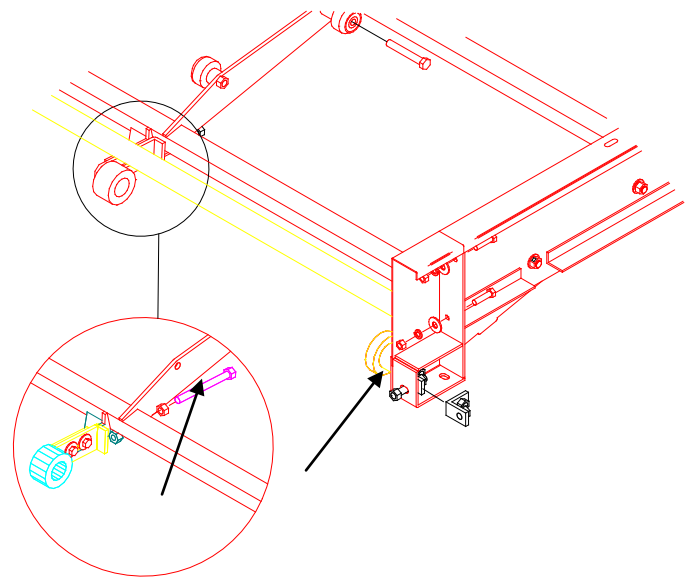
SECONDARY CONVEYOR DEFLECTION (TYPICAL)

4. Adjusting Tension:

- Loosen the jam nuts on the adjusting bolts.
- Turn the adjusting bolts to set the tension. Turn bolts on both ends the same amount to maintain roller alignment.
- Check the tension again. Over tightening will cause belt stretching and overload the bearing. Belts that are too loose will slip, snag and wear rapidly.
- Tighten jam nuts.
- Install and secure as required.



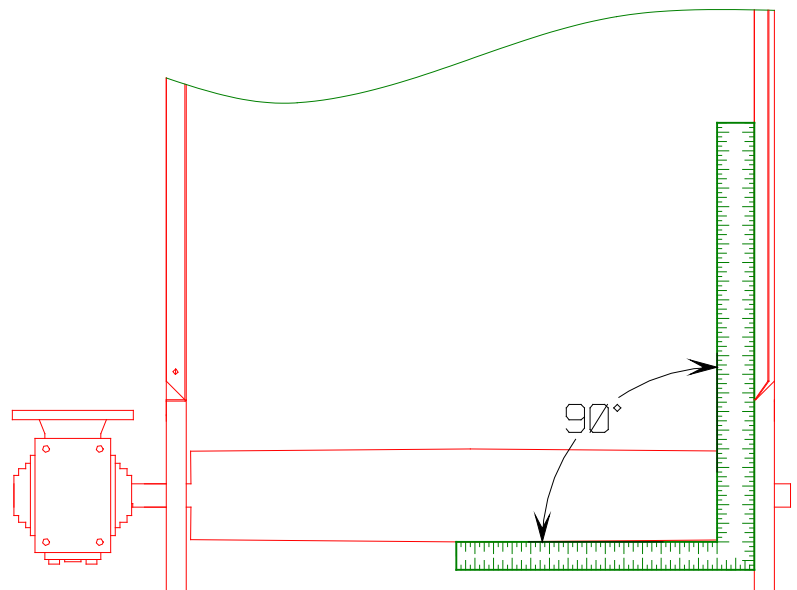
ELEVATOR BELT



ADJUSTING BOLTS PRIMARY

5. Roller alignment:

- Lay a square between the frame over the roller. The roller must be at right angles to the frame for the conveyor to track properly.
 - Use the adjusting bolts on the ends to align the roller. Tighten jam nuts when alignment has been completed.
 - Set the belt tension.
6. Be sure all guards are installed and secure before resuming work.



ROLLER (TYPICAL)



WARNING

Machine is shown with guard
Opened for illustrative purposes
Only. Do not operate machine
With guard opened.

BROWNING GEAR REDUCER MAINTENANCE

GEARBOX OIL CHANGING AND BREATHER CLEANING

When maintaining the gearboxes, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Stop machine, disconnect power lines and wait for all parts to stop moving.
3. **Checking Oil Level:**
 - a. Remove the level plug in the gearbox

IMPORTANT

Check the level only when the oil is cold and the machine is level.

- b. Oil in the reservoir should just fill the threads of the level plughole.
 - c. Add oil if low or allow the reservoir to drain if overfilled.
 - d. Install and tighten level plug

IMPORTANT

It is necessary to maintain the recommended oil level in the gearbox. A low level causes heating from lack of lubrication and rapid gear and bearing wear. Too much oil causes heating from oil churning and can cause seal and breather leaks.

4. Changing Oil:

- a. Place a collection pan or pail under the drain plug.
- b. Remove the drain plug.
- c. Dispose of the oil in an approved manner. Do not contaminate the worksite with used oil.
- d. Install and tighten the drain plugs.
- e. Remove fill and level plugs.
- f. Add oil, per EPT manual, to gearbox until the oil is just starting to come out of the level plughole.

IMPORTANT

Condensation forms and collects inside the reservoirs during machine operation. Changing oil removes this water and prevents it from damaging the gears and bearings.

- g. Install and tighten the level and fill plugs.

5. Cleaning Breathers:

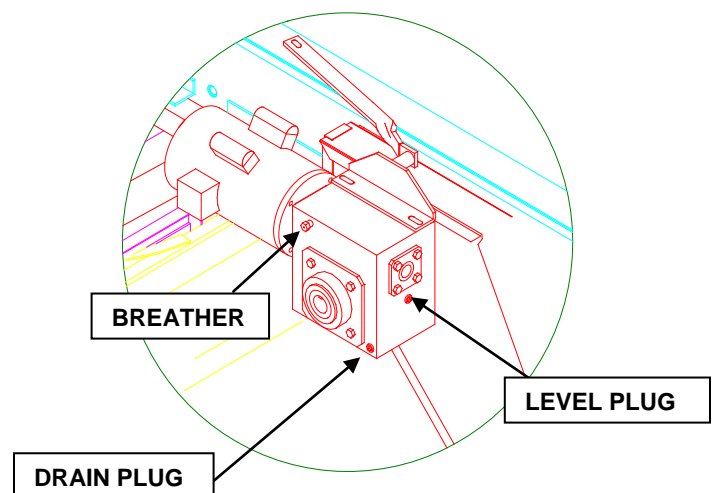
- a. Remove breathers and blow out with an air hose.
 - b. If dirt has caked up in the breather, soak in good solvent and then blow out. It may be necessary to use a probe to loosen the dirt.
 - c. Install and tighten the breather or replace if necessary

APPROVED OIL TYPES

BROWNING GEARHEADS

90 WEIGHT OIL AND EP OIL ARE NOT RECOMMENDED.

For Ambient temperatures -40°F to 15°F use **MOBIL SHC634**, 15°F to 125°F use **AGMA #8C** lubricant.



BROWNING GEARBOX

WINSMITH GEARHEAD LUBRICATION & MAINTENANCE

1. Factory Filling & Oil Type

WINSMITH S-EQUALIZER units are factory filled with the proper amount of synthetic lubricant, SCH 629. Synthetic lubricants can be advantageous over mineral oils in that they generally are more stable, have a longer life, and operate over a wider temperature range. These oils are appropriate for any application but are especially useful when units are subjected to low start up temperatures or high operating temperatures. However, continuous operation above 200° F may cause damage to the seals or other components.

2. Ambient Temperature

Synthetic oil SCH 629 is suitable for operation in an ambient range of -30° F to 110° F. If units operate continuously in ambient below 0° F, SCH 629 would be a suitable alternate lubricate.

3. Oil Quantity

Because air expands at a greater rate than oil, the volume of oil used in S-EQUALIZER units will be greater than that of similar standard units, thereby keeping the equalizer feature to a minimum practical size. The oil volume shown in the table will insure that no measurable pressure build up occurs over a temperature change of up to 100° F. At lesser operating temperature differentials, a lesser volume of oil can be tolerated without building internal pressure, but this should be reviewed with the factory.

Because of the varying oil quantities, the normal level plugs are not appropriate for monitoring oil levels.

USE TABLE ON FOLLOWING PAGE FOR PROPER OIL LEVELS.

WINSMITH GEARHEADS DO NOT HAVE BREATHERS, they have an s-equalizer installed on unit from factory.

WINSMITH S-EQUALIZER units are factory filled with the proper amount of **SYNTHETIC** lubricant, **SCH 629**

4. Changing Oil

a. USE SYNTHETIC OIL ONLY

IMPORTANT

It is recommended that the initial oil be changed or filtered after the first **1500 hours** of operation to remove metal particles that accumulate during break-in. Subsequent oil changes can be extended to **5000 hours** or more depending on operating conditions

- b. Before draining , the unit should be allowed to cool to room temperature.
- c. Remove drain plug (See illustration on following page).
- d. Drain reducer completely.
- e. Flush reducer with light flushing oil.
- f. Replace drain plug.
- g. Remove fill plug (See illustration on following page).
- h. Fill reducer with proper amount of synthetic oil according to table on following page.
- i. Replace fill plug.

IMPORTANT

DO NOT OVER FILL! THIS WILL CAUSE PREMATURE FAILURE OF REDUCER.

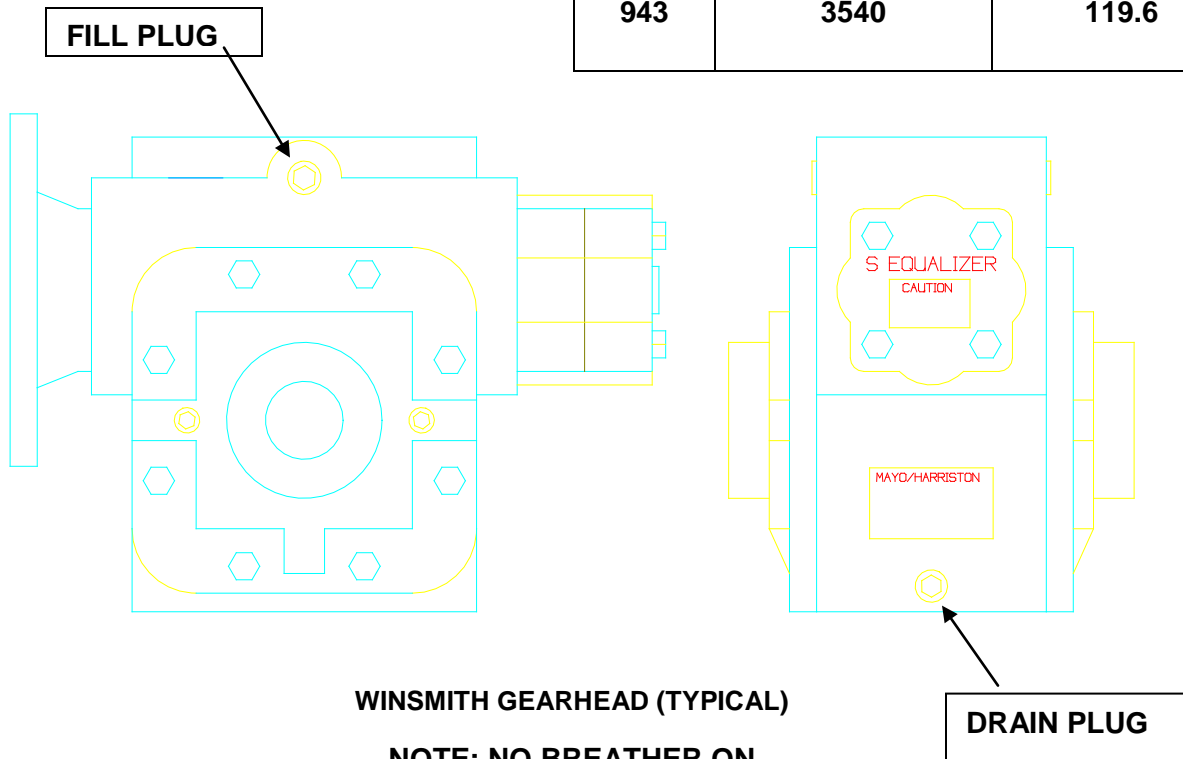
IMPORTANT!

PROPER LEVEL OF OIL IS CRITICAL TO LONG LIFE OF REDUCER. If reducer forms a leak for any reason, leak must be repaired and oil replaced to proper level according to table.
DO NOT ADD TO REMAINING OIL.

AT START OF SEASON GEAR REDUCERS MAY BE STUCK FROM SITTING IN STORAGE. IT IS RECOMMENDED THAT REDUCERS BE TURNED TO CRACK LOOSE BEFORE OPERATION.

WINSMITH OIL TABLE

SIZE	OIL VOLUME	
	MILLILITERS	FLUID OZ.
913	270	9.13
917	560	18.9
920	620	21
924	1180	39.9
926	1450	49
930	1770	59.8
935	2525	85.3
943	3540	119.6



WINSMITH GEARHEAD (TYPICAL)

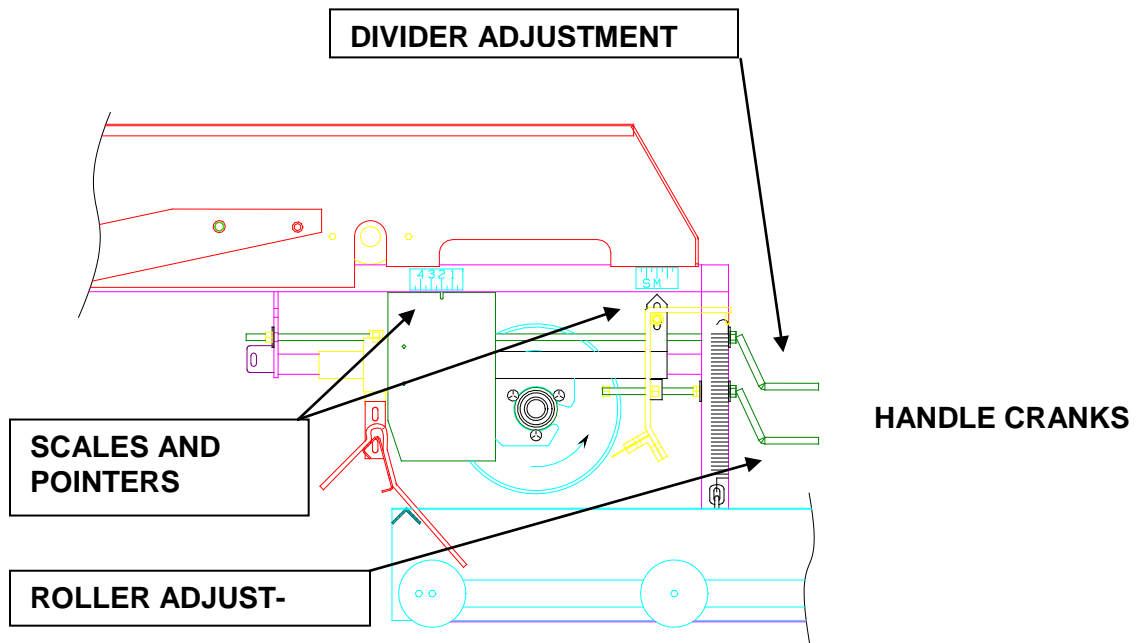
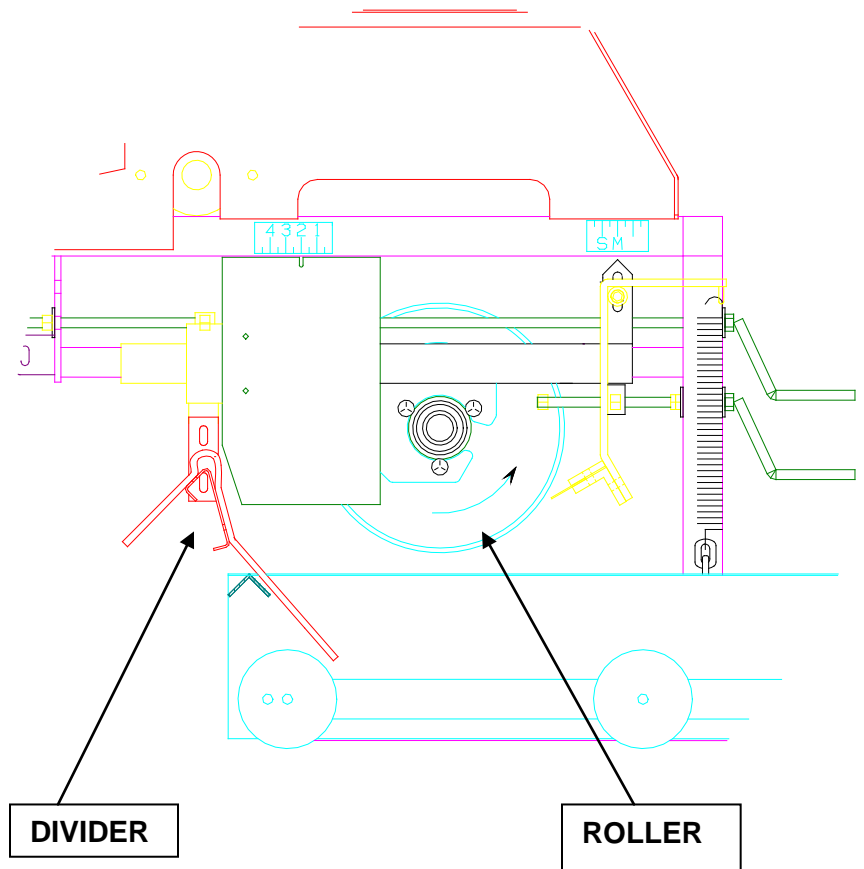
NOTE: NO BREATHER ON WINSMITH GEARHEAD.

ROLLER AND DIVIDER POSITION

The position of the roller and divider control the cleaning action of the machine.

To set the position, follow this procedure:

1. Clear the area of bystanders especially small children.
2. Stop machine, disconnect power lines and wait for all moving parts to stop before setting the position.
3. Use the top handle crank to set the divider position and the bottom one to set the roller.
4. Move the handle crank the same number of turns on each end to maintain alignment.
5. Move each component in 2 to 4 turn increments and check the performance. A small change in position can result in a significant change in performance.
6. Use the scales and pointers on each end as a guide.

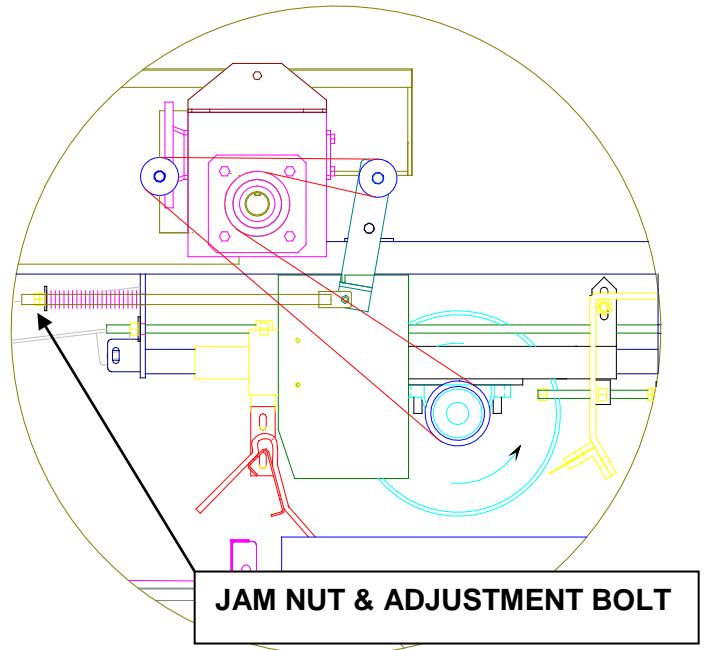


ROLLER CHAIN TENSION

Roller chains are used to synchronize the roller and conveyor speeds. A spring-loaded idler is used to maintain the spring tension.

To set chain tension, follow this procedure:

1. Clear the area of bystanders especially small children.
2. Stop machine, disconnect power lines and wait for all moving parts to stop before setting the position.
3. Remove shield over roller chain.
4. Loosen jam nut on adjusting bolt.
5. Push on the adjusting bolt to check spring compression. A 10 lb. Force should be required to compress the spring.
6. Tighten adjusting bolt as required to set compression force.
7. Tighten jam nut.
8. Close and secure guard.



IDLER SPROCKET (TYPICAL)



Machine is shown with guard opened for illustrative purposes only. Do not operate machine with guard opened.

6 TROUBLE SHOOTING

The Harriston Clod Hopper is a high capacity machine for removing clods, stones and debris from produce. It is a simple and reliable system that requires minimal maintenance.

In the following section, we have listed many of the problems, causes and solutions to the problems that you may encounter.

If you encounter a problem that is difficult to solve, after having read through this trouble shooting section, please call your local Harriston dealer. Before you call, please have this Operator's Manual and the Serial number from your Clod Hopper ready.

PROBLEM	CAUSE	SOLUTION
Machine won't run.	No power.	Move Master Switch on the control panel to the "ON" position.
		Connect power lines to the 3 power Input lines.
		NOTE The 110 volt household power line must be plugged in. This controls the relays in the circuits. Call your local certified electrician to Check the circuits.
One motor doesn't run.	Defective relay.	Have an electrician replace relay.
Trash in produce discharge Or produce in trash.	Wrong position for roller Or divider.	Set rollers to 10:00 to 10:30 position And divider at separating line.
	Uneven feeding.	Distribute flow of material across Machine. Use the hopper divider.
	Dirty rollers.	Clean rollers.
Conveyor belt slipping.	Conveyor too loose.	Tighten conveyor belt.
Conveyor belt running to One side.	Roller not square.	Align roller at right angle to frame.

7 UNLOADING AND ASSEMBLY



ASSEMBLY SAFETY

1. Use jacks, hoists and cranes with sufficient capacity for the heavy components.
2. Use 2 men to lift and direct the heavy components.

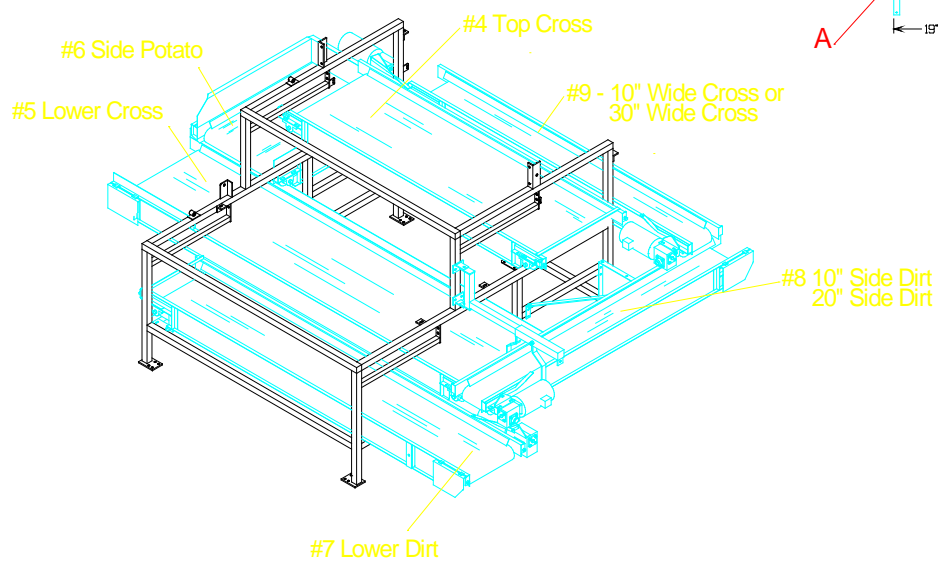
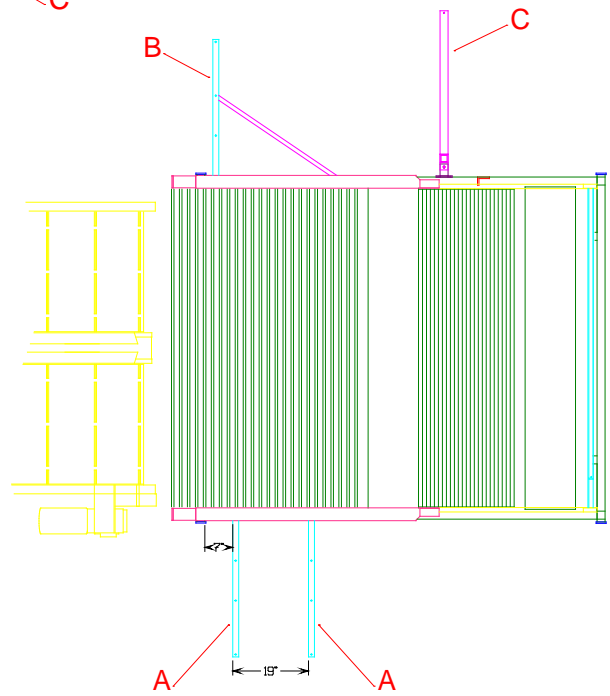
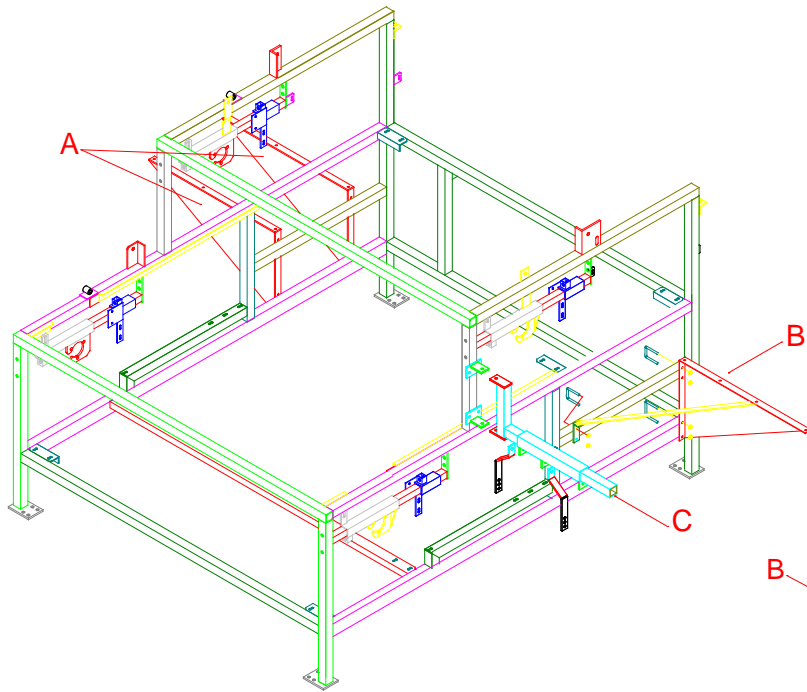
The machine is shipped from the factory in a partially disassembled configuration. Follow this procedure when unloading and assembling:

1. Clear the area of bystanders especially small children.
2. Move the truck to the unloading area.
3. Remove all the frame tie downs
4. Remove the tires from their shipping position.
5. Raise the frame and install the tires. Tighten wheel nuts to their specified torque.
6. Pull the machine off the truck and move to the assembly area.
7. Select an area that is large enough to allow easy access from all sides.
8. Use 2 men to handle the heavy components and jacks or hoists with sufficient capacity for the job.
9. Remove the strapped down conveyors, motor supports and hardware.

10. Install and secure the triangular mounting frames (A & B) & Conveyor Support Arm Assembly (C) on each side of the frame.
11. Install and secure cross conveyors #3 and #5.
12. Install and secure conveyors #6 and #7
13. Install and secure conveyors #8 and #9.
14. Install and secure the motor on conveyor #4.
15. Tighten all hardware to its specified torque.

NOTE

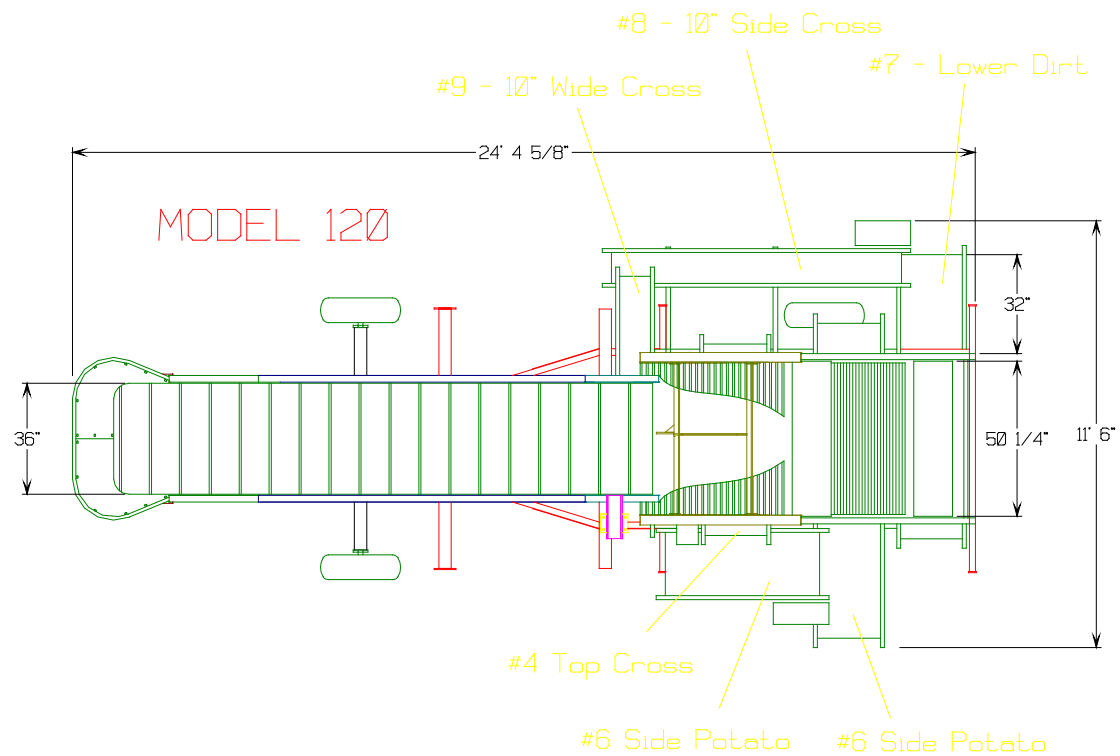
Refer to the schematics on the following page for assembly details.



8 SPECIFICATIONS

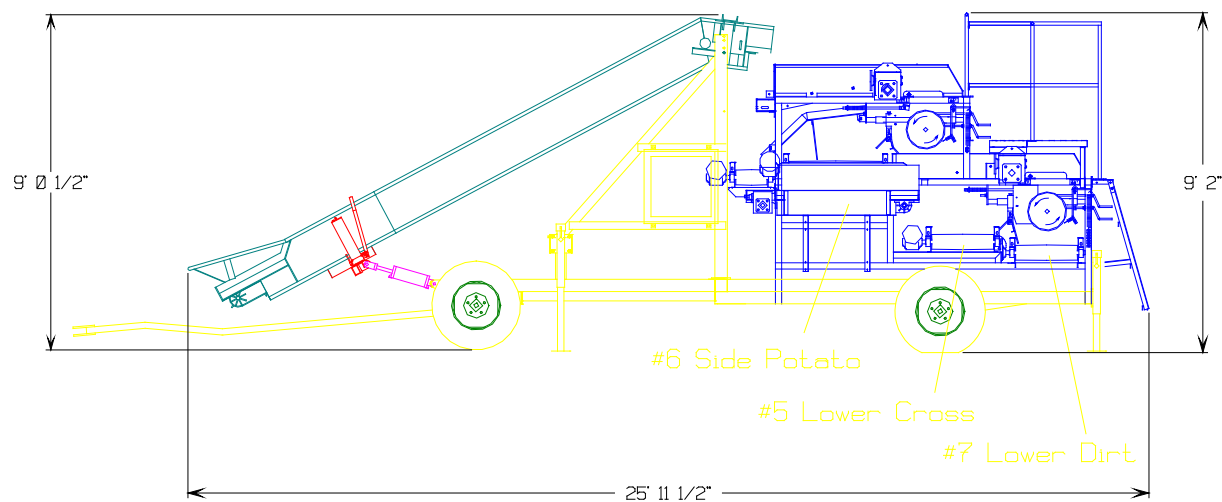
MODEL 120

TOP VIEW



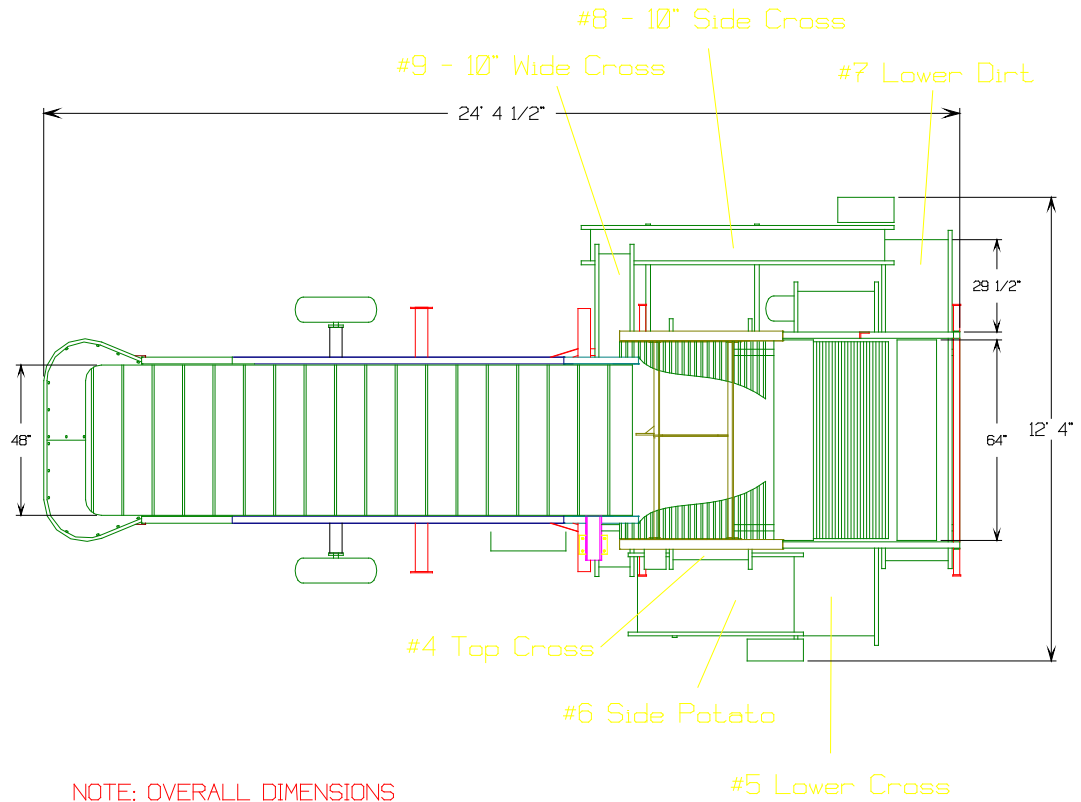
NOTE: OVERALL DIMENSIONS
ARE APPROXIMATE.

SIDE VIEW

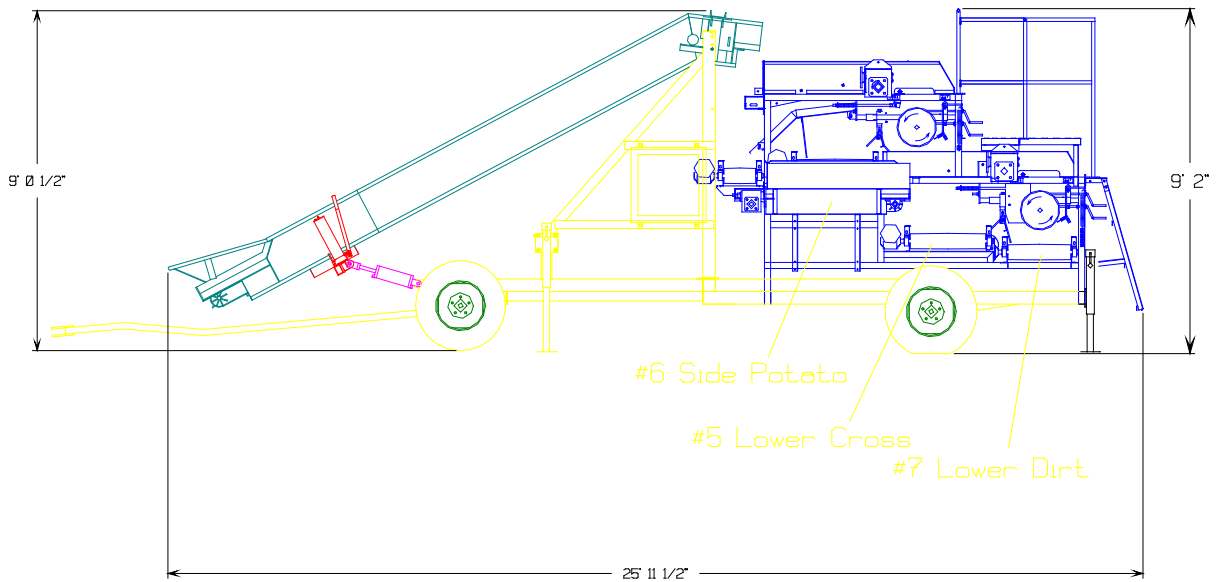


MODEL 160

TOP VIEW

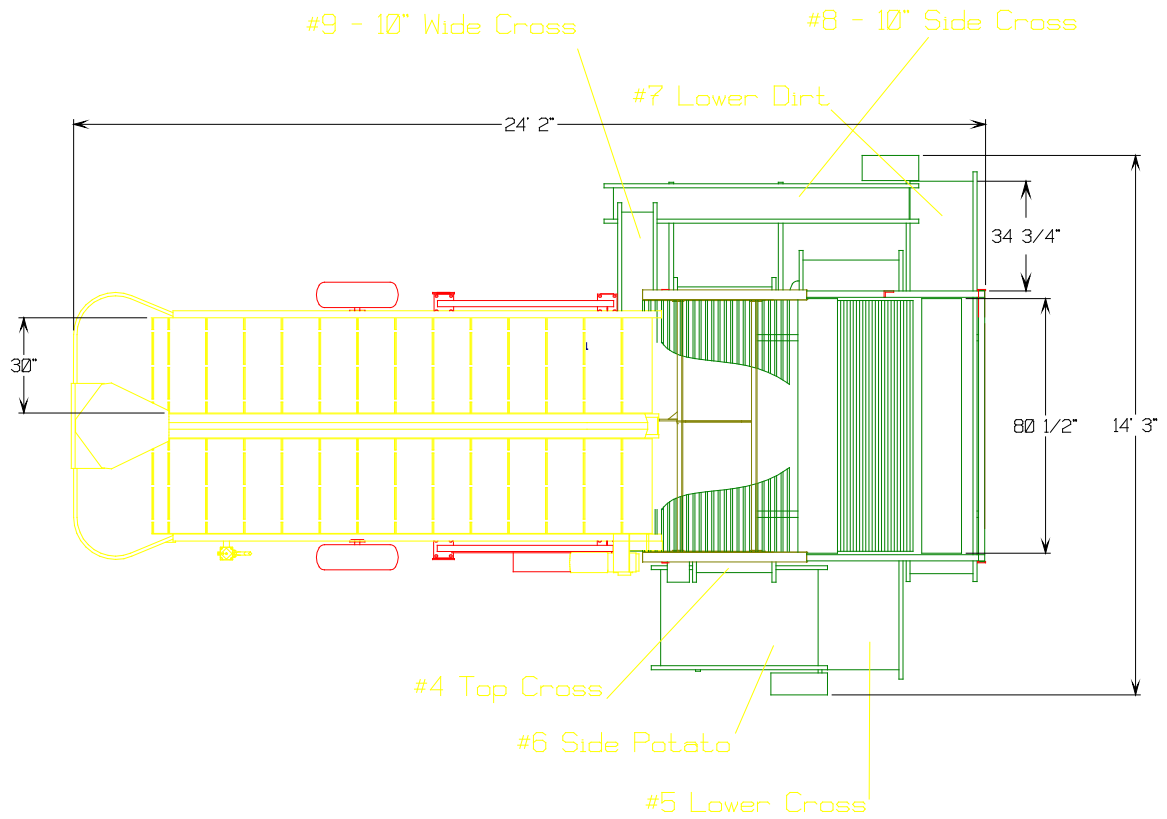


SIDE VIEW



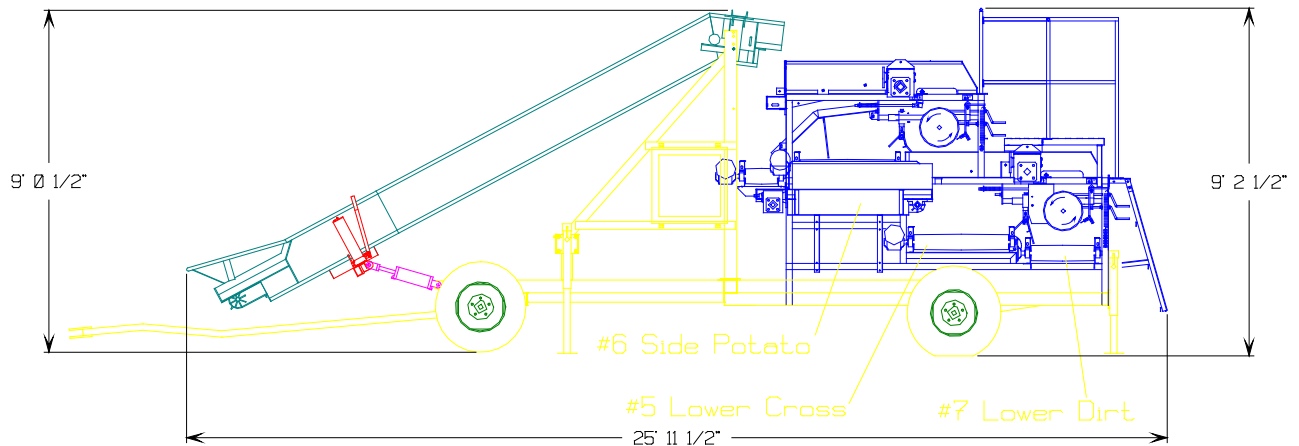
MODEL 200

TOP VIEW



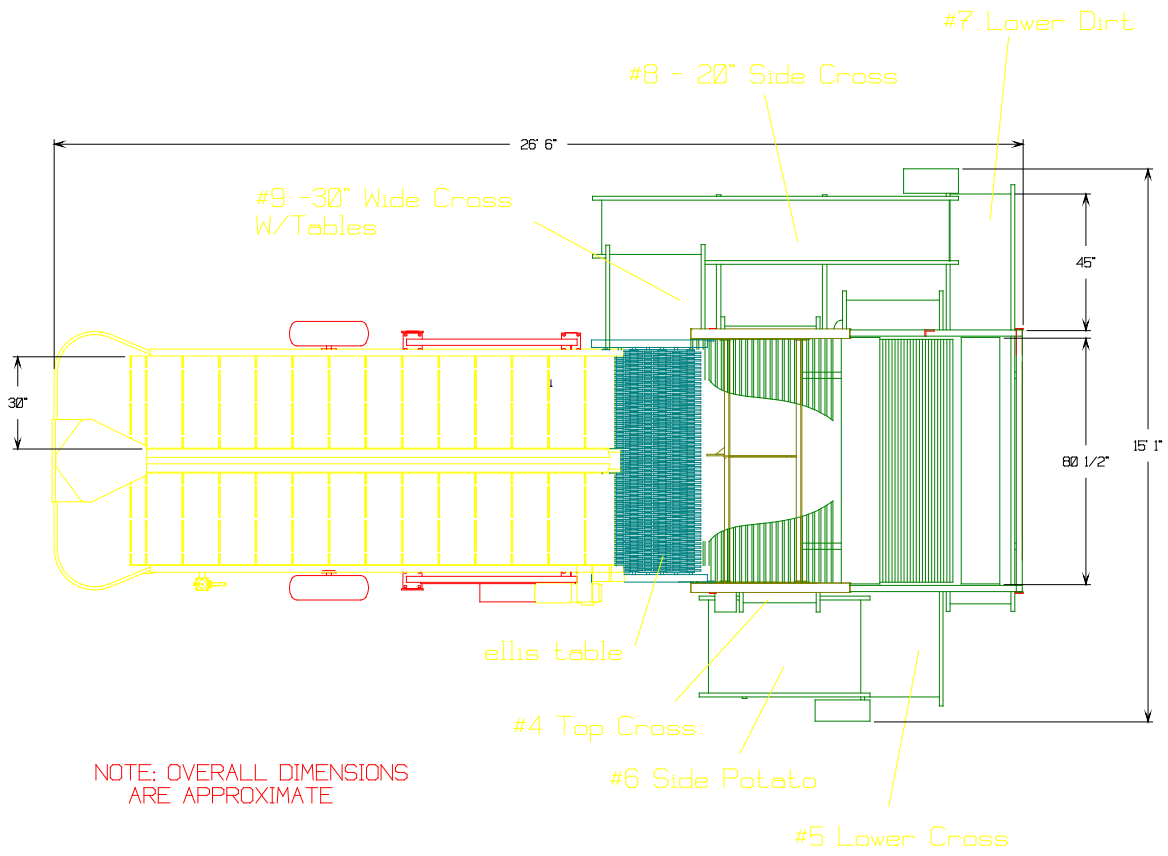
NOTE: OVERALL DIMENSIONS
ARE APPROXIMATE

SIDE VIEW

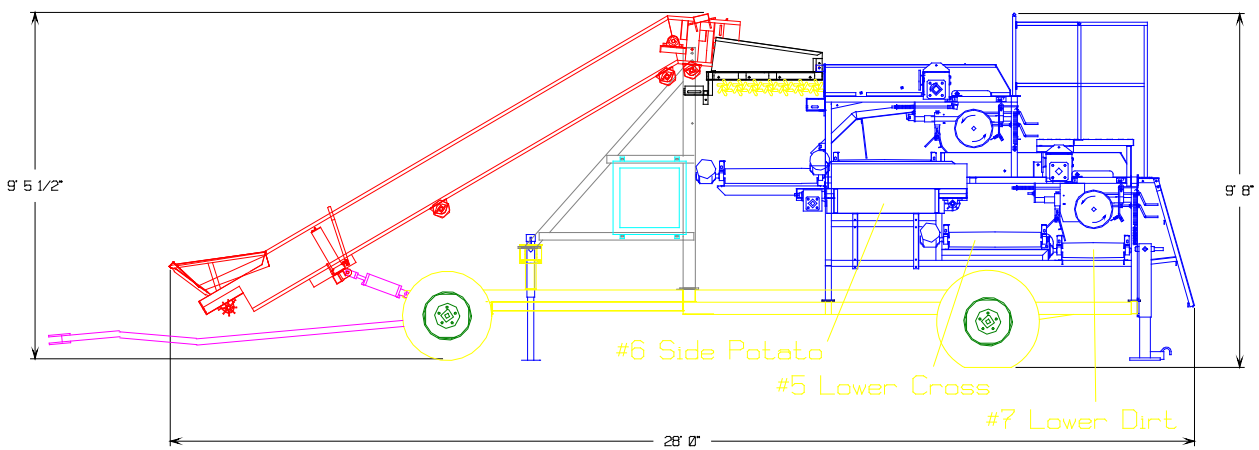


MODEL 200 W/QUICK ADJUST SS TABLE

TOP VIEW

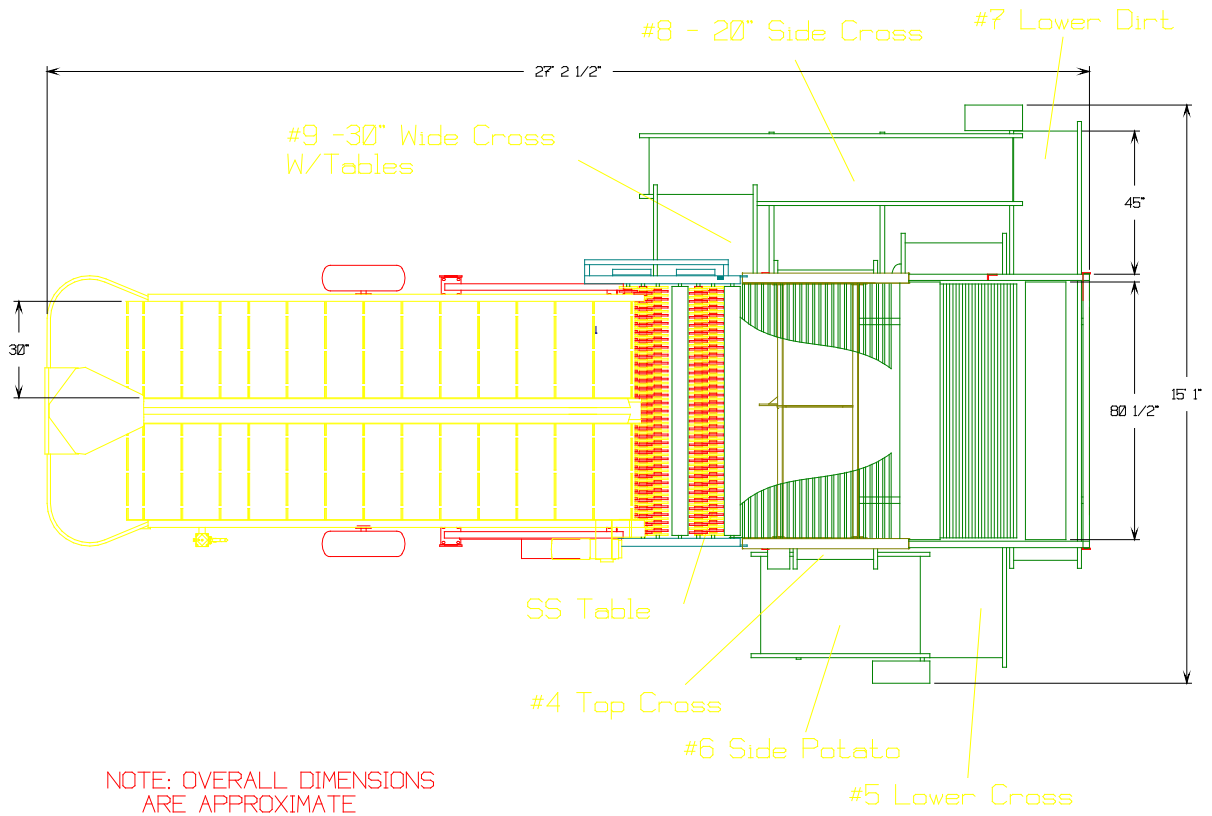


SIDE VIEW

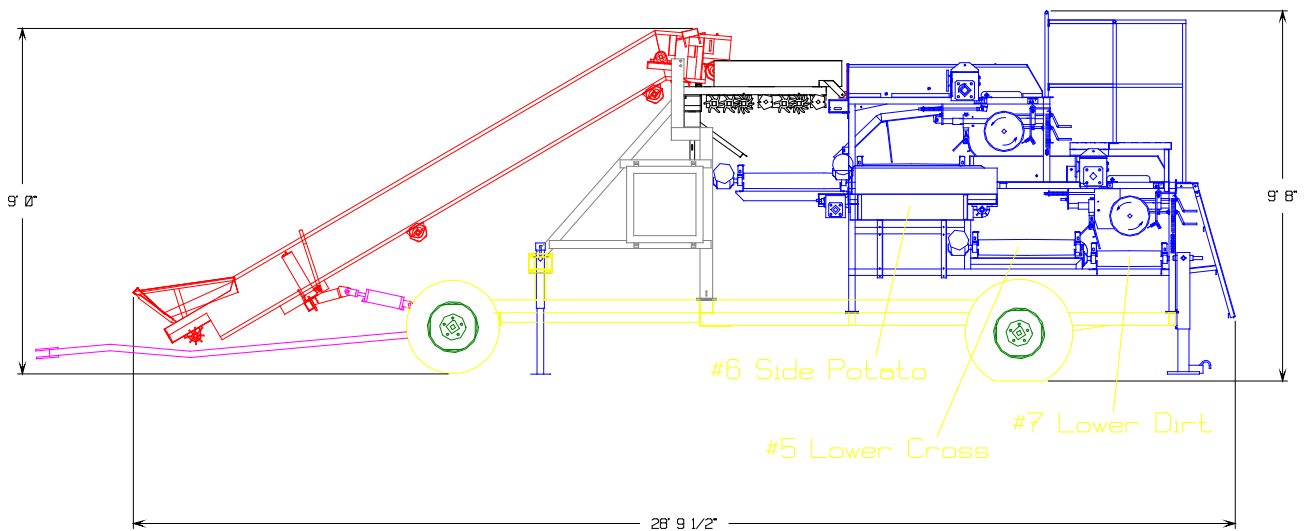


MODEL 200 W/SS TABLE

TOP VIEW

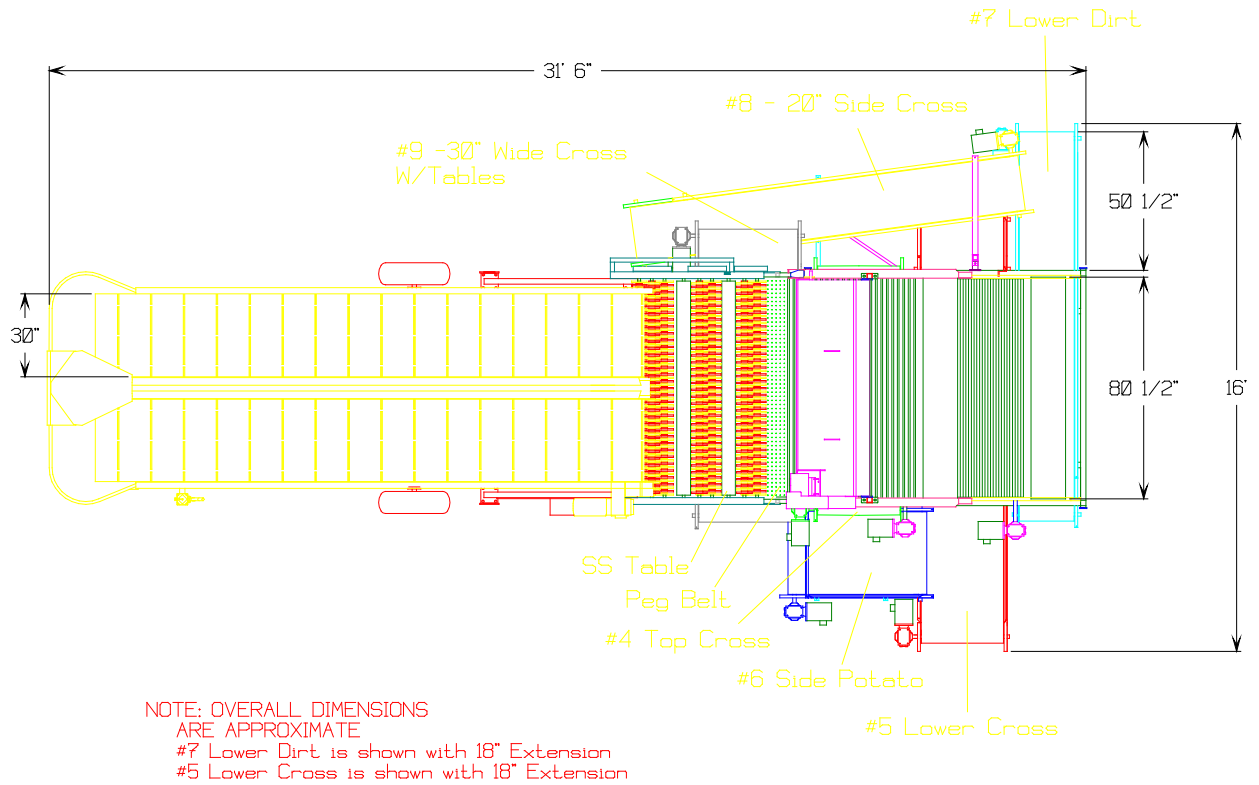


SIDE VIEW

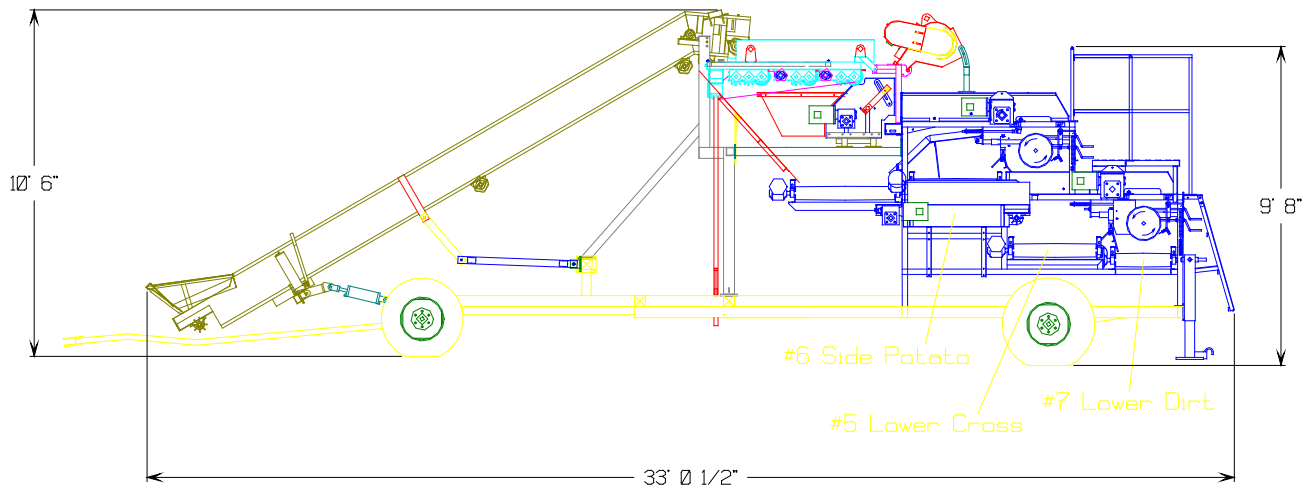


MODEL 200 W/ PEG BELT & 7 Roller SS TABLE

TOP VIEW

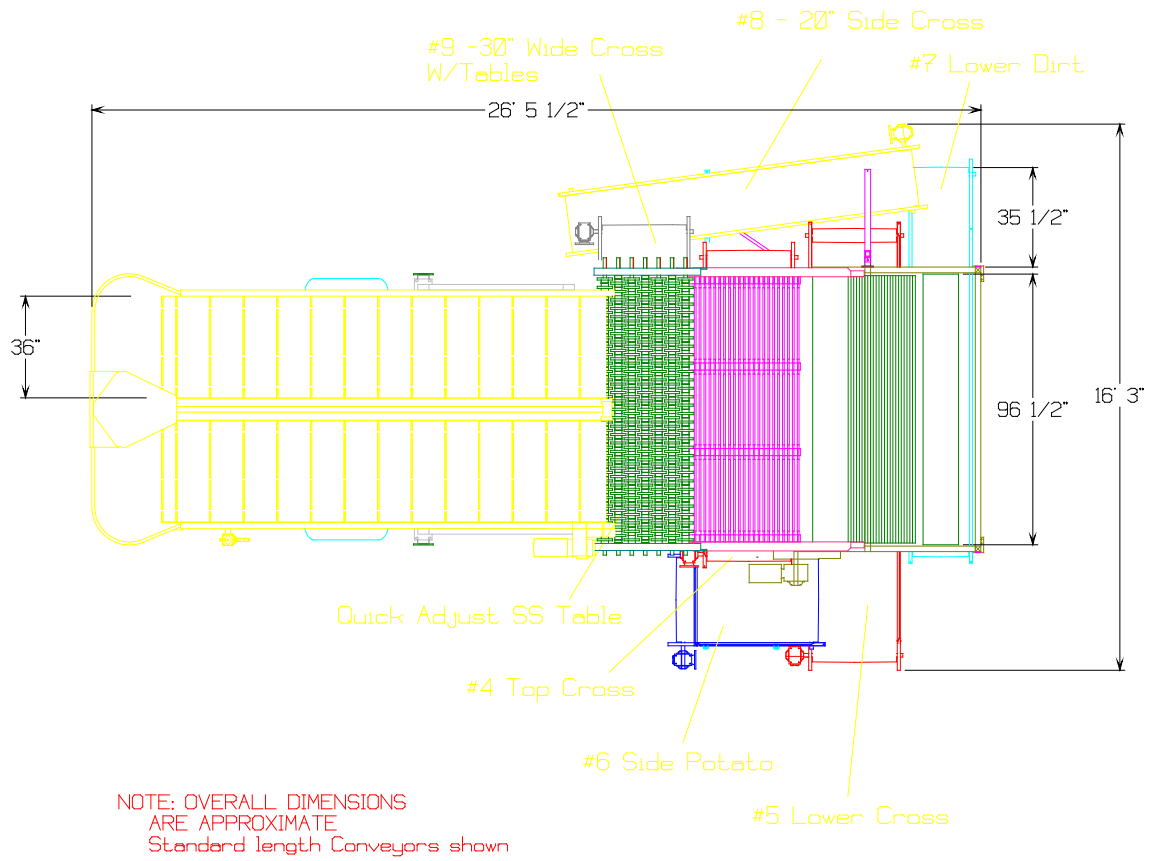


SIDE VIEW

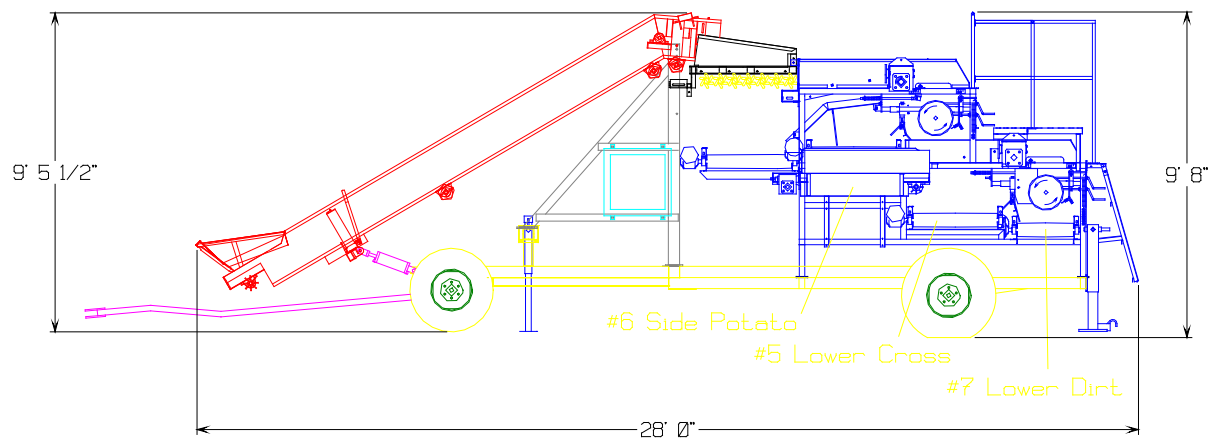


MODEL 240 W/ QUICK ADJUST SS TABLE

TOP VIEW

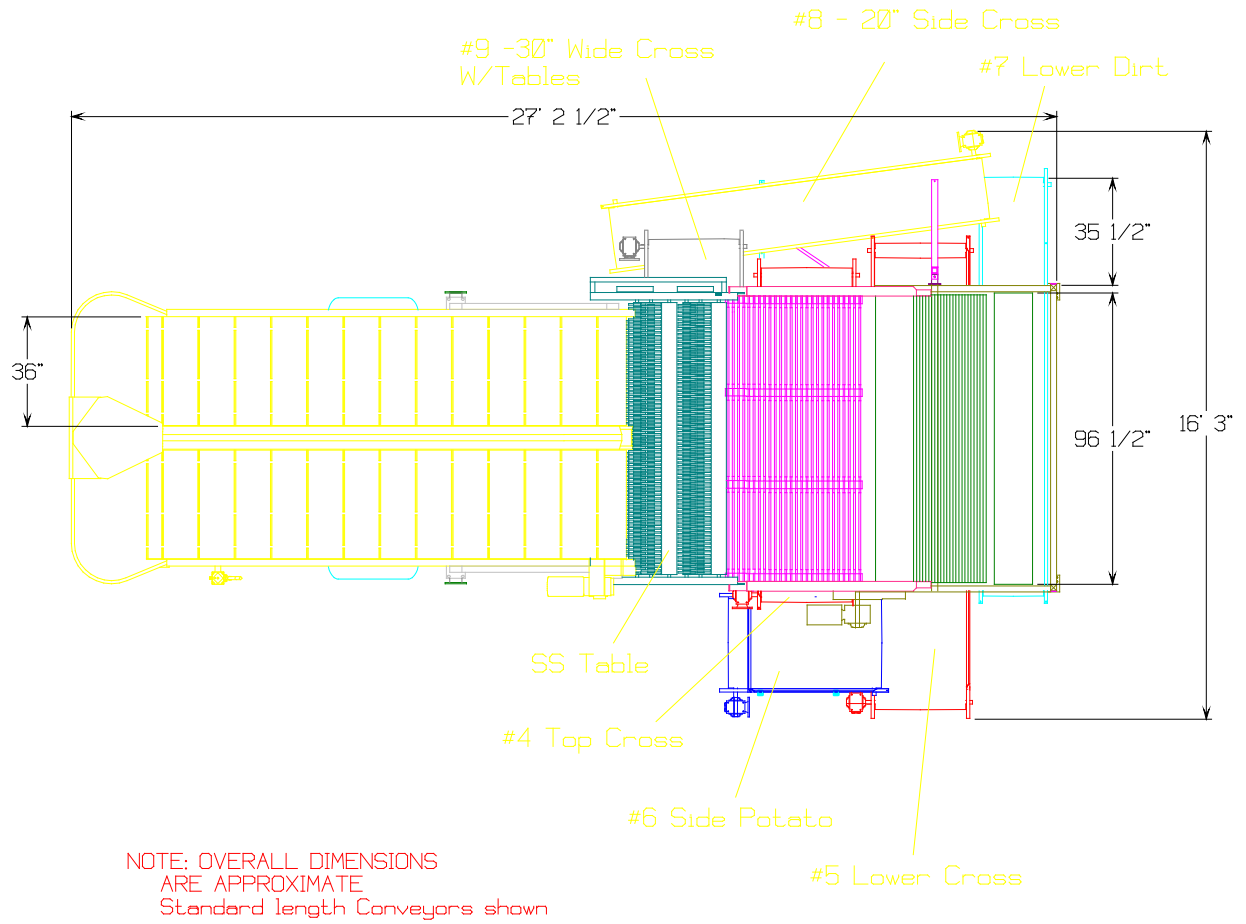


SIDE VIEW

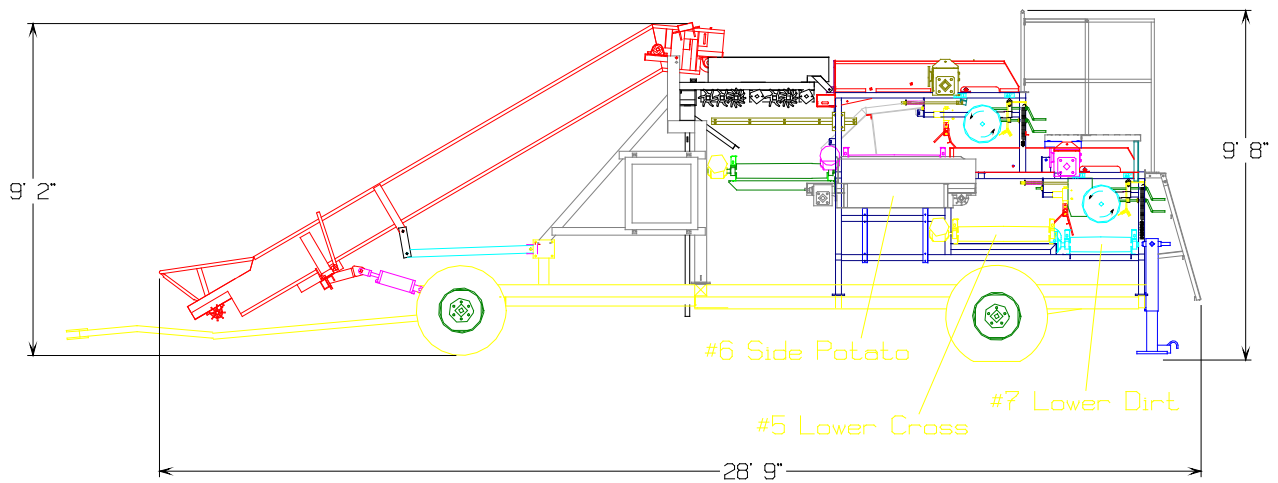


MODEL 240 W/ SS TABLE

TOP VIEW

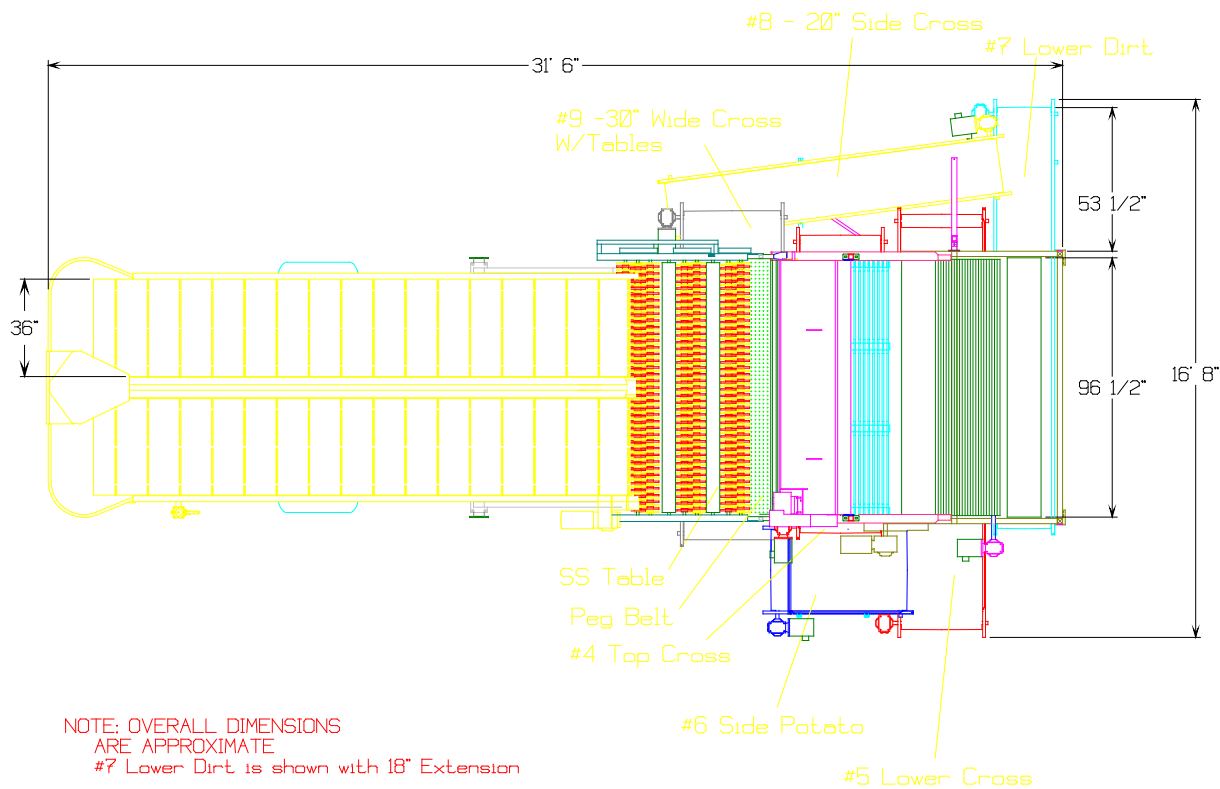


SIDE VIEW

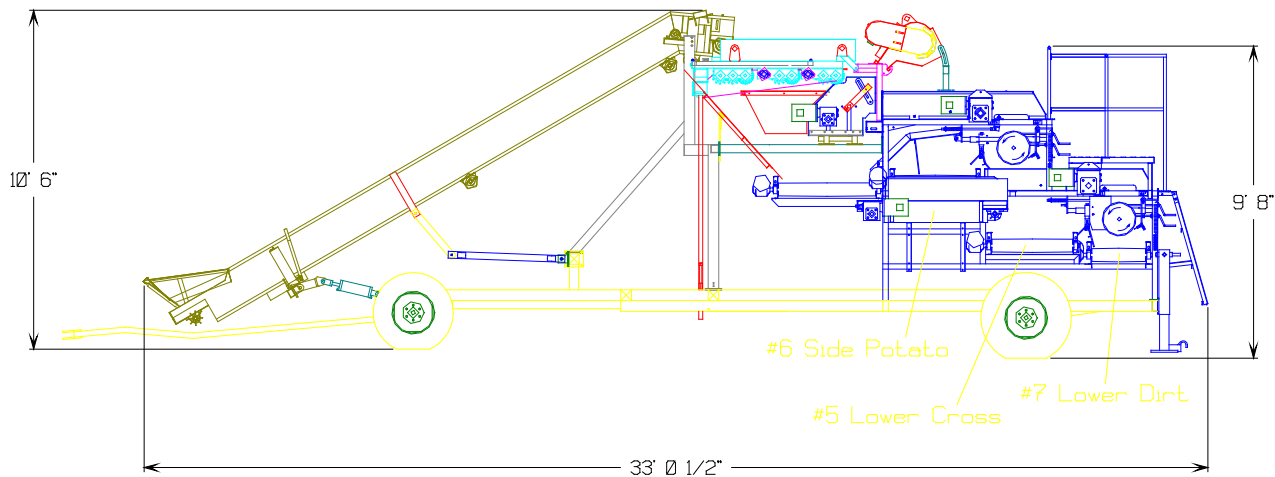


MODEL 240 W/ PEG BELT & 7 ROLLER STAR TABLE

TOP VIEW



SIDE VIEW



SPECIFICATIONS

MECHANICAL

DIMENSIONS	MODEL 120	MODEL 160	MODEL 200	MODEL 240
Electric motors	6-1/2 HP, 2-1 HP, 1-3 HP	1-3 hp, 2-1 1/2 hp, 4-1 HP, 2-1/2 hp	4-1 HP, 2-2 HP, 1-3 HP 2-1/2 HP	3-1 HP, 3-1 1/2 HP, 1-2 HP, 2-5 HP
Electrical supply	1 ph 240v 56A 3ph 208/240 v 30A 3ph 440v 15A	1ph 240v 69A 3ph 208/240v 39A 3ph 440v 19A	1ph 240v 82A 3ph 208/240v 47A 3ph 480v 24A	1ph 240v 100A 3ph 208/240v 59A 3ph 480v 30A
Feed width	36"	48"	70"	82"
Separation width	48"	60"	80"	96"
Transport length	26'	26'	26'	28'
W/ Quick Adjust Table			28'	28'
W/ Standard Adjust Table			28' 9"	28' 9"
W/ Peg Belt			33'	33'
Transport width	10' 5"	11' 6"	14' 3"	16' 3"
Transport height	9' 2"	9' 2"	9' 2"	9' 8"
W/ Table			9' 8"	9' 8"
W/ Peg Belt			10' 6"	10' 6"
Shipping width	7' 8"	7' 6"	8' 6"	10' 4"
Weight	6250 lbs. (appr.)	7275 lbs. (appr.)	8250 lbs. (appr.)	12,000 lbs. (appr.)
Capacity	up to 50 T/H	up to 65 T/H	up to 75 T/H	up to 90 ton/hr
Wheel Base	96"	96"	96"	98"

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

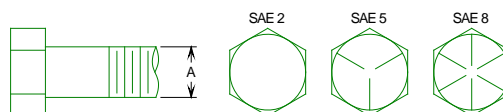
BOLT TORQUE

CHECKING BOLT TORQUE

The tables shown below give correct torque values for various bolts and capscrews. Tighten all bolts to the torques specified in chart unless otherwise noted. Check tightness of bolts periodically, using bolt torque chart as a guide. Replace hardware with the same strength bolt.

ENGLISH TORQUE SPECIFICATIONS

Bolt Diameter	SAE 2		Bolt Torque SAE 5		SAE 8	
	N.m.	(lb – ft)	N.m.	(lb – ft)	N.m.	(lb – ft)
1/4"	8	6	12	9	17	12
5/16"	13	10	25	19	36	27
3/8"	27	20	45	33	63	45
7/16"	41	30	72	53	100	75
1/2"	61	45	110	80	155	115
9/16"	95	70	155	115	220	165
5/8"	128	95	215	160	305	220
3/4"	225	165	390	290	540	400
7/8"	230	170	570	420	880	650
1"27	345	225	850	630	1320	970



Torque figures indicated above are valid for non-greased or non-oiled threads unless otherwise specified. Therefore, do not grease or oil bolts or capscrews unless otherwise specified in this manual. When using locking elements, increase torque values by 5%.

* Torque values for bolts and capscrews are identified by their head markings.

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