

Harriston Industries



HARRISTON INDUSTRIES 4240 CLOD HOPPER OPERATOR'S MANUAL

HARRISTON INDUSTRIES, INC. LIMITED 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

HARRISTON INDUSTRIES, INC.

MODEL 4240 CLOD HOPPER

WARRANTY REGISTRATION FORM & INSPECTION REPORT

WARRANTY REGISTRATION (please print)

This form must be filled out by the dealer and signed by both the dealer and the customer at the time of delivery.

Customer's Name _____ Dealer's Name _____
Address _____ Address _____
City, State/Prov., Code _____ City, State/Prov., Code _____
Phone Number (_____) _____
Conveyor Model _____
Serial Number _____
Delivery Date _____

DEALER INSPECTION REPORT

- ____ Inspect Electrical System
- ____ Machine Lubricated
- ____ Drive Belts and Chains Tensioned and Aligned
- ____ Speed Reducer Gearbox Oil Level Checked
- ____ Lubricate Machine
- ____ Conveyors Tensioned and Aligned

SAFETY

- ____ Guards and Shields Installed and Secured
- ____ Review Operating and Safety Instructions
- ____ All Decals Installed
- ____ All Refelctors, Lights and SMV Installed,
Clean and In Good Working Order.

I have thoroughly instructed the buyer on the above described equipment which review included the Operator's Manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____ Dealer's Rep. Signature _____

Signature _____

The above equipment and Operator's Manual have been received by me and I have been thoroughly instructed as to care, adjustments, safe operation and applicable warranty policy.

Date _____ Owner's Signature _____

WHITE	YELLOW	PINK
HARRISTON IND. INC.	DEALER	CUSTOMER

SERIAL NUMBER LOCATION

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

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



SERIAL NUMBER LOCATION

Clod Hopper	_____
Model	_____
Serial Number	_____

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1 INTRODUCTION

Congratulations on your choice of a Harriston Model 4240 Clod Hopper and welcome to Harriston's quality line of potato equipment. This equipment is designed and manufactured to meet the needs of a discriminating buyer in the potato industry for the efficient handling of potatoes.

Safe, efficient and trouble free operation of your new 4240 Clod Hopper requires that you, and anyone else who will be operating or maintaining the Clod Hopper, read, understand and practice ALL of the Safety, Operation, Maintenance and Trouble Shooting recommendations contained within this Operator's Manual.



This manual applies to the 4240 Clod Hopper manufactured by Harriston. Certain options may be available to specifically tailor the Clod Hopper to your operation and may not be included in this manual. Please contact the manufacturer regarding additional information about these options. Use the Table of Contents and Index as a guide to find specific information.

Keep this manual handy for frequent reference and so that it will be passed on to new operators or owners. Call your Harriston dealer if you need assistance, information or additional copies of this manual.

MACHINE ORIENTATION - The Elevator end of the Clod Hopper is the front. All controls are on the left side of the frame.

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 your 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 You Money
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 guide-lines:

- | | |
|------------------|--|
| DANGER - | Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded. |
| WARNING - | Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices. |
| CAUTION - | Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. |

If you have any questions not answered in this manual or require additional copies or the manual is damaged, please contact your dealer or Harriston Industries, 500 Ordway , Box 378, Minto, ND 58261, Phone: (701) 248-3286, Toll Free: (800) 437-8205, Fax: (701) 248-3070, Email: harriston@invisimax.com, or visit the Website: www.harriston-mayo.com.

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 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 machine is familiar with the procedures recommended and follows safety precautions. Remember, most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

- Read and understand the Operator's Manual and all safety signs before supplying power, operating, maintaining or adjusting the Clod Hopper.
- 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 these. Most accidents can be avoided.
- A person who has not read and understood all operating and safety instructions is not qualified to operate this 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!

2.1 GENERAL SAFETY

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

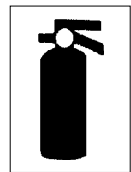


2. Only trained, competent persons shall operate the Scale Conveyor. An untrained operator is not qualified to operate this machine.

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



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



5. Install and properly secure all guards and shields before operating.

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



- Protective shoes with slip resistant soles
- Protective glasses or goggles
- Heavy gloves
- Hearing protection

7. Turn machine OFF, shut down and lockout power supply, relieve hydraulic pressure and wait for all moving parts to stop before servicing, adjusting, maintaining, repairing or cleaning. (Safety lockout devices are available through your Harriston dealer parts department).


8. Know the emergency medical center number for your area.

9. Review safety related items with all operators annually.

2.2 EQUIPMENT SAFETY GUIDELINES

1. Safety of the operator and bystanders is one of the main concerns in designing and developing a machine. However, every year many accidents occur which could have been avoided by a few seconds of thought and a more careful approach to handling equipment. You, the operator, can avoid many accidents by observing the following precautions in this section. To avoid personal injury or death, study the following precautions and insist those working with you, or for you, follow them.
2. In order to provide a better view, certain photographs or illustrations in this manual may show an assembly with a safety shield removed. However, equipment should never be operated in this condition. Keep all shields in place. If shield removal becomes necessary for repairs, replace the shield prior to use.
3. Replace any safety sign or instruction sign that is not readable or is missing. Location of such safety signs is indicated in this manual.
4. Never use alcoholic beverages or drugs which can hinder alertness or coordination while operating this equipment. Consult your doctor about operating this machine while taking prescription medications.
5. **Under no circumstances should young children be allowed to work with this equipment. Do not allow persons to operate or assemble this unit until they have read this manual and have developed a thorough understanding of the safety precautions and of how it works. Review the safety instructions with all users annually.**
6. This equipment is dangerous to children and persons unfamiliar with its operation. The operator should be a responsible, properly trained and physically able person familiar with farm machinery and trained in this equipment's operations. If the elderly are assisting with farm work, their physical limitations need to be recognized and accommodated.
7. Never exceed the limits of a piece of machinery. If its ability to do a job, or to do so safely, is in question - **DON'T TRY IT.**
8. Do not modify the equipment in any way. Unauthorized modification may result in serious injury or death and may impair the function and life of the equipment.
9. In addition to the design and configuration of this implement, including Safety Signs and Safety Equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence, and proper training of personnel involved in the operation, transport, maintenance, and storage of the machine. Refer also to Safety Messages and operation instruction in each of the appropriately sections of the auxiliary equipment and machine Manuals. Pay close attention to the Safety Signs affixed to the auxiliary equipment and the machine.

2.3 SAFETY TRAINING

1. Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by a single careless act of an operator or bystander.
2. In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence and proper training of personnel involved in the operation, transport, maintenance and storage of this equipment.
3. It has been said, "The best safety feature is an informed, careful operator." We ask you to be that kind of an operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow these. Most accidents can be avoided.
4. **Working with unfamiliar equipment can lead to careless injuries. Read this manual, and the manual for your auxiliary equipment, before assembly or operating, to acquaint yourself with the machines. If this machine is used by any person other than yourself. It is the machine owner's responsibility to make certain that the operator, prior to operating:**
 - a. **Reads and understands the operator's manuals.**
 - b. **Is instructed in safe and proper use.**
5. Know your controls and how to stop auxiliary conveyors and any other auxiliary equipment quickly in an emergency. Read this manual and the one provided with your other equipment.
6. Train all new personnel and review instructions frequently with existing workers. Be certain only a properly trained and physically able person will operate the machinery. 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. If the elderly are assisting with farm work, their physical limitations need to be recognized and accommodated.

2.4 SAFETY SIGNS

1. Keep safety signs clean and legible at all times.
2. Replace safety signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety signs displayed in Section 3 each have a part number in the lower right hand corner. Use this part number when ordering replacement parts.
5. Safety signs are available from your authorized Distributor or Dealer Parts Department or the factory.

How to Install Safety Signs:

- Be sure that the installation area is clean and dry.
- Be sure temperature is above 50° F (10° C).
- Determine exact position before you remove the backing paper. (See Section 3).
- Remove the smallest portion of the split backing paper.
- Align the sign over the specified area and carefully press the small portion with the exposed sticky backing in place.
- Slowly peel back the remaining paper and carefully smooth the remaining portion of the sign in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of sign backing paper.

2.5 PREPARATION

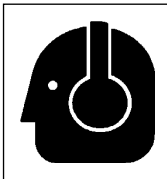
1. Never operate the Clod Hopper and auxiliary equipment until you have read and completely understand this manual, the auxiliary equipment Operator's Manual, and each of the Safety Messages found on the safety signs on the Clod Hopper and auxiliary equipment.

2. Personal protection equipment including hard hat, safety glasses, safety shoes, and gloves are recommended during assembly, installation, operation, adjustment, maintaining, repairing, removal, or moving the implement. Do not allow long hair, loose fitting clothing or jewelry to be around equipment.



3. **PROLONGED EXPOSURE TO LOUD NOISE MAY CAUSE PERMANENT HEARING LOSS!**

Motors or equipment attached can often be noisy enough to cause permanent, partial hearing loss. We recommend that you wear hearing protection on a full-time basis if the noise in the Operator's position exceeds 80 db. Noise over 85 db on a long-term basis can cause severe hearing loss. Noise over 90 db adjacent to the Operator over a long-term basis may cause permanent, total hearing loss. **NOTE:** Hearing loss from loud noise (from tractors, chain saws, radios, and other such sources close to the ear) is cumulative over a lifetime without hope of natural recovery.



4. Clear working area of debris, trash or hidden obstacles that might be hooked or snagged, causing injury, damage or tripping.
5. Operate only in daylight or good artificial light.
6. Be sure machine is properly stabilized, adjusted and in good operating condition.
7. Ensure that all safety shielding and safety signs are properly installed and in good condition.
8. Before starting, give the machine a "once over" for any loose bolts, worn parts, cracks, leaks, loose chains and make necessary repairs. Always follow maintenance instructions.

2.6 INSTALLATION SAFETY

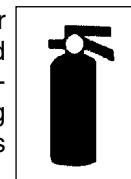
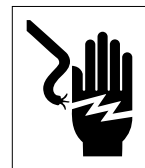
1. Remove all transport devices that would hinder or prohibit the normal functioning of the Machine upon start up. Serious damage to the machine and/or personal injury to the operator and bystanders may result from attempting to operate the machine while transport locking devices are still in place.
2. Position the machines on firm, level ground before operating.
3. Have at least one extra person available to assist when elevating, moving or connecting to other equipment.
4. Make certain that sufficient amperage, at the proper voltage and frequency (60Hz) is available before connecting power. All wiring should comply with ANSI/NFPA 70 electrical requirements. If you are uncertain, have a licensed electrician provide power to the machine.
5. If using the Clod Hopper as part of material handling system, anchor securely to other conveying equipment before starting.

2.7 OPERATING SAFETY

1. Make sure that anyone who will be operating the Clod Hopper or working on or around the units reads and understands all the operating, maintenance and safety information in the operator's manual. Also read and follow the instructions in the manuals of other equipment in the system.
2. **Turn machine OFF, shut down and lock out power supply (safety lockout devices are available through your Harriston dealer parts department) and wait for all moving parts to stop before servicing, adjusting, maintaining or repairing.**
3. Establish a lock-out tag-out policy for the work site. Be sure all personnel are trained in and follow all procedures. Lock-out tag-out all power sources before servicing the unit or working around loading/unloading equipment.
4. **Make sure all control switches are in the OFF position before connecting power supply.**
Before supplying electrical power to the machine, be sure that you have adequate amperage at the proper phase and voltage to run it. If you do not know or are unsure, consult a licensed electrician.
5. Keep working area clean and free of debris to prevent slipping or tripping.
6. Keep hands, feet, hair and clothing away from rotating and moving parts. Do not wear loose-fitting clothing when working on or around the Clod Hopper. Long hair must also be appropriately restrained close to the body. Keep others away.
7. Install and secure all guards before starting.
8. Keep all electrical components in good condition before operating.
9. Review safety related items annually with all personnel who will be operating, using or maintaining the Clod Hopper.

2.8 MAINTENANCE SAFETY

1. Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
2. 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.
3. **Turn machine OFF, shut down and lock out power supply (safety lockout devices are available through your Harriston dealer parts department) and wait for all moving parts to stop before servicing, adjusting, maintaining or repairing.**
4. **Do not work on Clod Hopper electrical system unless the power cord is unplugged or the power supply is locked out. Lock-out tag-out power source before performing any maintenance work.**
5. Always use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance.
6. Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.
8. A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
9. Support the machine with wood blocking or safety stands when changing tires or working beneath the Clod Hopper. Do not use cement blocks.
10. When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.



2.9 LOCK-OUT TAG-OUT SAFETY

1. Establish a formal Lock-Out Tag-Out program for your operation.
2. Train all operators and service personnel before allowing them to work around the unloading system.
3. Provide tags on the machine and a sign-up sheet to record tag out details.
4. Do not service or maintain the Clod Hopper unless the power is turned OFF and disconnected. Keep others away.

2.10 STORAGE SAFETY

1. Store the Clod Hopper on a firm, level surface.
2. If required, make sure the unit is solidly blocked up. Use the jacks to stabilize and support the frame.
3. Make certain all mechanical locks are safely and positively connected before storing.
4. Store away from areas of human activity.
5. Do not permit children to play on or around the stored machine.
6. Lock out power by turning OFF at master control panel or junction box and padlocking the door shut to prevent electrocution or unauthorized start-up of the Clod Hopper.

2.11 TRANSPORT SAFETY

1. Make certain that you are in compliance with local, state/provincial, and federal regulations regarding transporting agricultural equipment on public roadways.
2. Make certain that all wheels and tires are in good repair and that tires are inflated to proper pressure. Do not under-inflate or overinflate.
3. Make certain that all wheel lug bolts are tightened to proper torque specifications.
4. Install the transport cylinder locks on the input conveyor and folding conveyor before transporting.
5. Add extra lights and use pilot vehicle(s) when transporting during times of limited visibility.
6. Wrap up and bind all electrical wires to the frame.
7. Be sure that any necessary SMV (slow moving vehicle) signs, reflectors, and lights required by law are in proper place and are clearly visible to all traffic.
8. Be sure the tow vehicle has adequate capacity and weight to safely tow the Clod Hopper.
9. Be sure to positively hitch to the towing vehicle. Use a retainer on the pin and a safety chain to assure a safe hitch hook-up when transporting.
10. Adhere to local regulations regarding maximum weight, width, and length.
11. Do not exceed 20 MPH (32 kph). Reduce speed on rough roads and surfaces.
12. Do not allow anyone to ride on the Clod Hopper or towing vehicle during transport.
13. Always use hazard flashers on the towing vehicle when transporting.

2.12 ELECTRICAL SAFETY

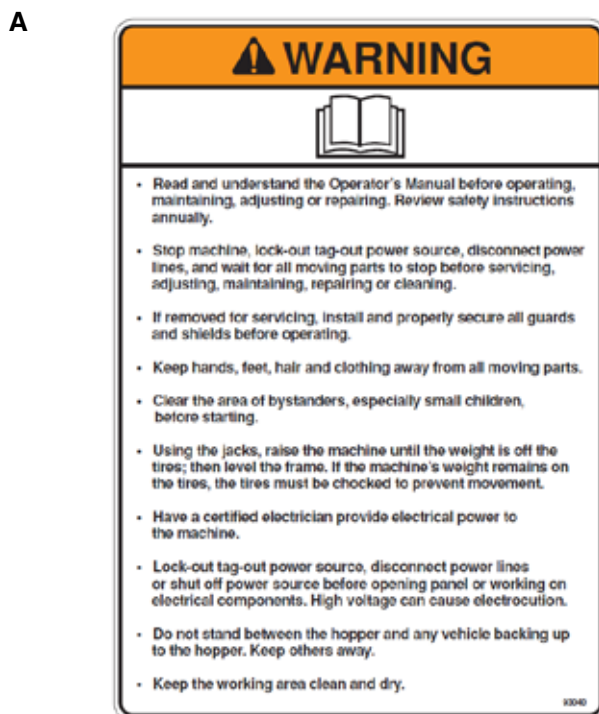
1. Have only a qualified electrician supply power. All wiring should comply with ANSI/NFPA 70 electrical requirements.
2. Make certain that the Clod Hopper is properly grounded at the power source.
3. Make certain that all electrical switches are in the OFF position before connecting power to the Clod Hopper.
4. **Turn machine OFF, shut down and lock out power supply (safety lockout devices are available through your Harriston dealer parts department) and wait for all moving parts to stop before servicing, adjusting, maintaining or repairing any part of the electrical system.**
5. Disconnect power before resetting any motor
6. Replace any damaged electrical plugs, cords, switches and components immediately.
7. Do not work on Clod Hopper electrical system unless the power cord is unplugged or the power supply is locked out.



3 SAFETY SIGN LOCATIONS

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

- Think SAFETY! Work SAFELY!

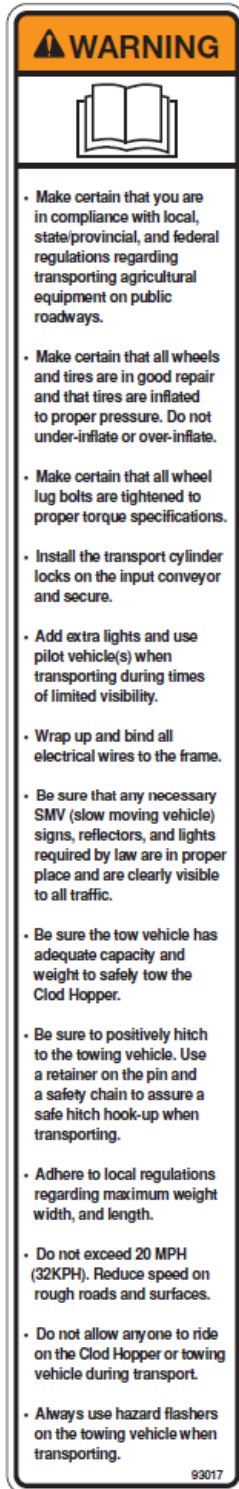


REMEMBER - If Safety Signs have been damaged, removed, become illegible or parts replaced without safety signs, new signs must be applied. New safety signs are available from your authorized dealer.

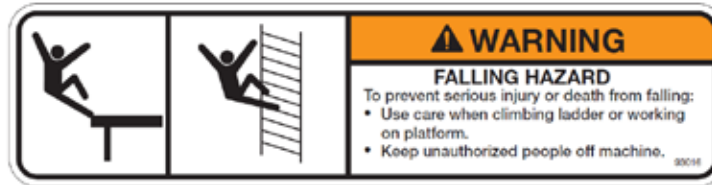
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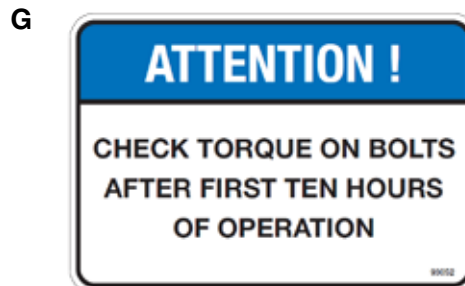
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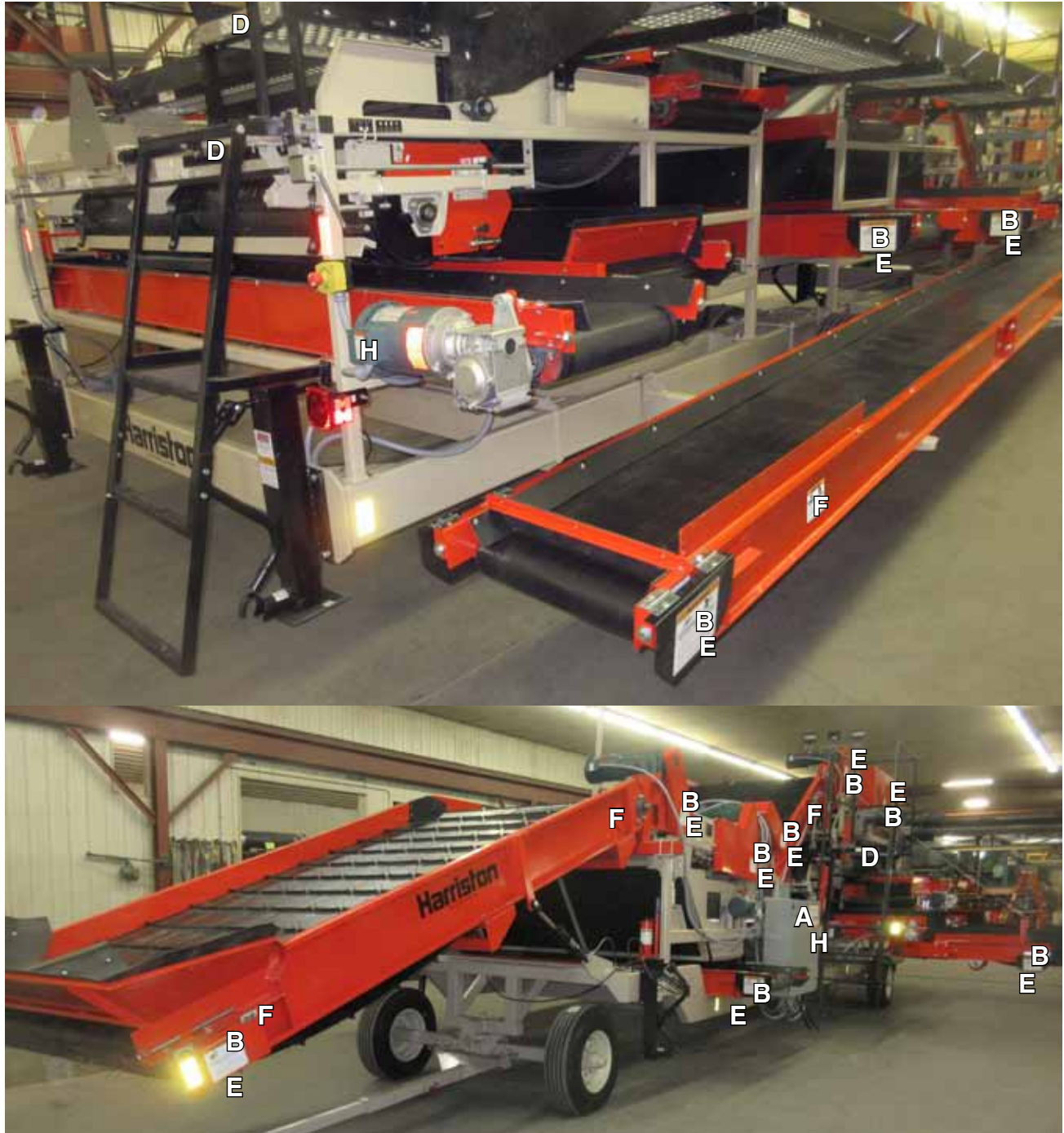
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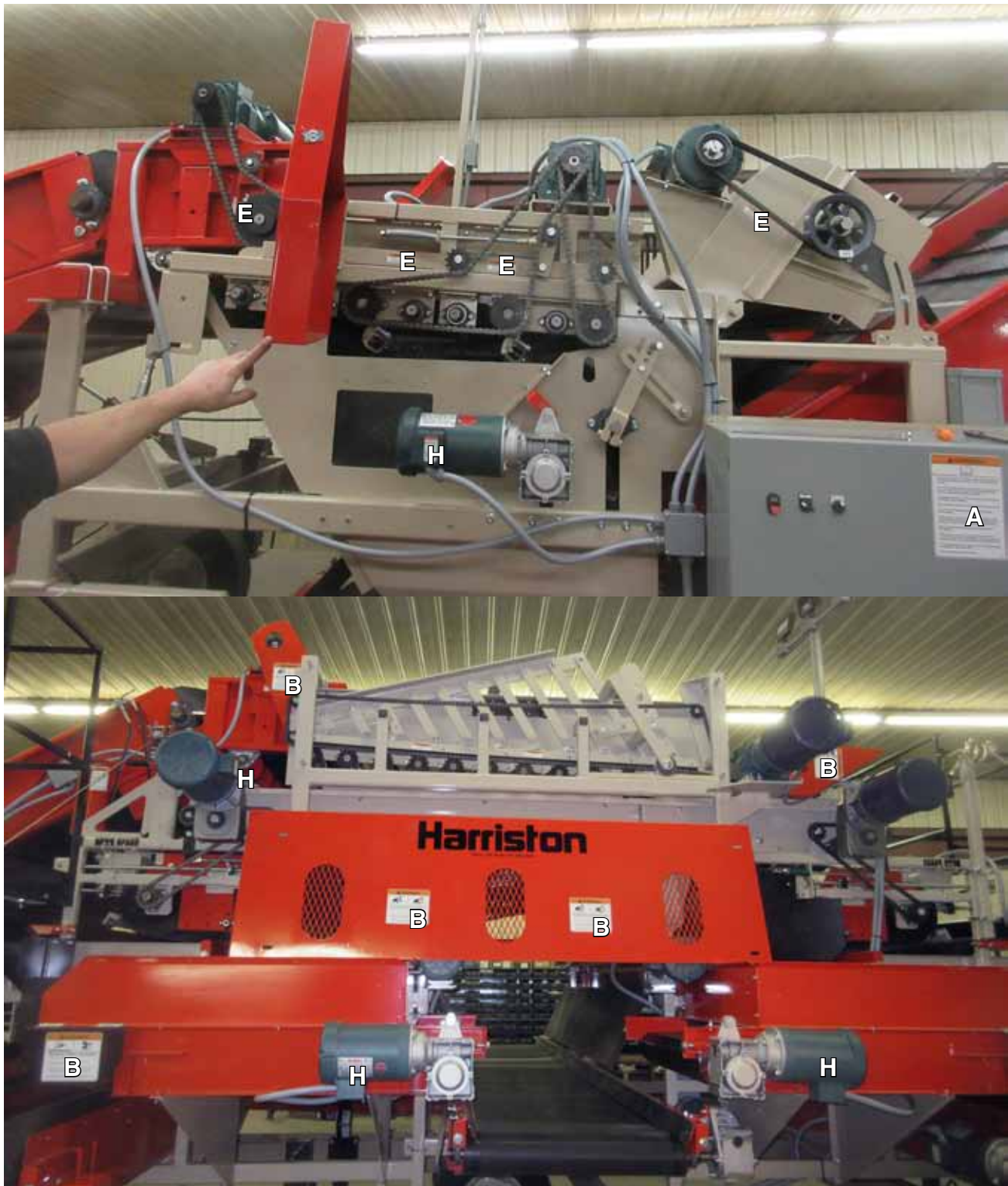
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4 OPERATION



OPERATING SAFETY

- Read and understand this Operator's Manual before operating, maintaining, adjusting, or repairing.
- Stop machine, disconnect power lines, and wait for all moving parts to stop before servicing, adjusting, maintaining, repairing, or cleaning.
- If removed for servicing, install and properly secure all guards and shields before operating.
- Keep hands, feet, hair, and clothing away from all moving parts.
- Clear the area of bystanders, especially small children, before starting.
- Using the jacks, raise the machine until the weight is off the tires; then level the frame. If the machine's weight remains on the tires, the tires must be chocked to prevent movement.
- Have a certified electrician provide electrical power to the machine.
- Disconnect power lines or shut off power source before opening panel or working on electrical components. High voltage can cause electrocution.
- Do not stand between the hopper and any vehicle backing up to the hopper. Keep others away.
- Keep the working area clean and dry.
- Review safety instructions annually.
- Make certain that you are in compliance with local, state/provincial, and federal regulations regarding transporting agricultural equipment on public roadways.
- Make certain that all wheels and tires are in good repair and that tires are inflated to proper pressure. Do not under-inflate or overinflate.
- Make certain that all wheel lug bolts are tightened to proper torque specifications.
- Install the transport cylinder locks on the input conveyor and secure.
- Add extra lights and use pilot vehicle(s) when transporting during times of limited visibility.
- Wrap up and bind all electrical wires to the frame.
- Be sure that any necessary SMV (slow moving vehicle) signs, reflectors, and lights required by law are in proper place and are clearly visible to all traffic.
- Be sure the tow vehicle has adequate capacity and weight to safely tow the Clod Hopper.
- Be sure to positively hitch to the towing vehicle. Use a retainer on the pin and a safety chain to assure a safe hitch hook-up when transporting.
- Adhere to local regulations regarding maximum weight, width, and length.
- Do not exceed 20 MPH (32 kph). Reduce speed on rough roads and surfaces.
- Do not allow anyone to ride on the Clod Hopper or towing vehicle during transport.
- Always use hazard flashers on the towing vehicle when transporting.

4.1 TO THE NEW OPERATOR OR OWNER

The Harriston Industries 4240 Clod Hopper is designed to quickly and efficiently separate dirt and stones from potatoes. Be familiar with the machine before starting.

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. In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, and prudence of personnel involved in the operation, transport, maintenance and storage of equipment or in the use of facilities.

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.

4.2 MACHINE 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 where it is elevated to the Ellis table where the dirt is removed. On models with the peg belt trash remover, the raw produce moves across the blower area where debris is blown on the peg belt and the vines and trash are removed. The raw produce is then elevated to the sizer where it is sized for the appropriately separating roller system.

As the stream of material flows over the separating rollers, 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 move the produce to the left side of the machine and the foreign material to the right side. Electric motors drive the machine.

Clod Hoppers perform best when a single layer of potatoes moves across the rollers. The 4240 divides the flow of potatoes into a large and small sizes in the sizing table in the center of the frame. This feature increases the capacity and performance of the machine. Small potatoes move forward and the large ones move back. After the dirt and stones have been removed, the clean potatoes can be combined.

- A Front Elevator Conveyor
- B Ellis Cleaning Table
- C Peg Belt Trash Remover
- D Blower
- E Secondary Elevator
- F Sizer Table
- G Large Potato Conveyor
- H Small Potato Conveyor
- J Small Potato Primary Roller
- K Small Potato Secondary Roller
- L Large Potato Primary Roller
- M Large Potato Secondary Roller
- N Left Side Platform
- O Rear Platform
- P Right Side Platform
- Q Front Dirt Conveyor
- R Center Dirt Conveyor
- S Small Potato Dirt Conveyor
- T Large Potato Dirt Conveyor
- U Side Dirt Conveyor
- V Small Potato Primary Conveyor
- W Small Potato Secondary Conveyor
- X Large Potato Primary Conveyor
- Y Large Potato Secondary Conveyor
- Z Control Panel
- a Potato Conveyor Extension

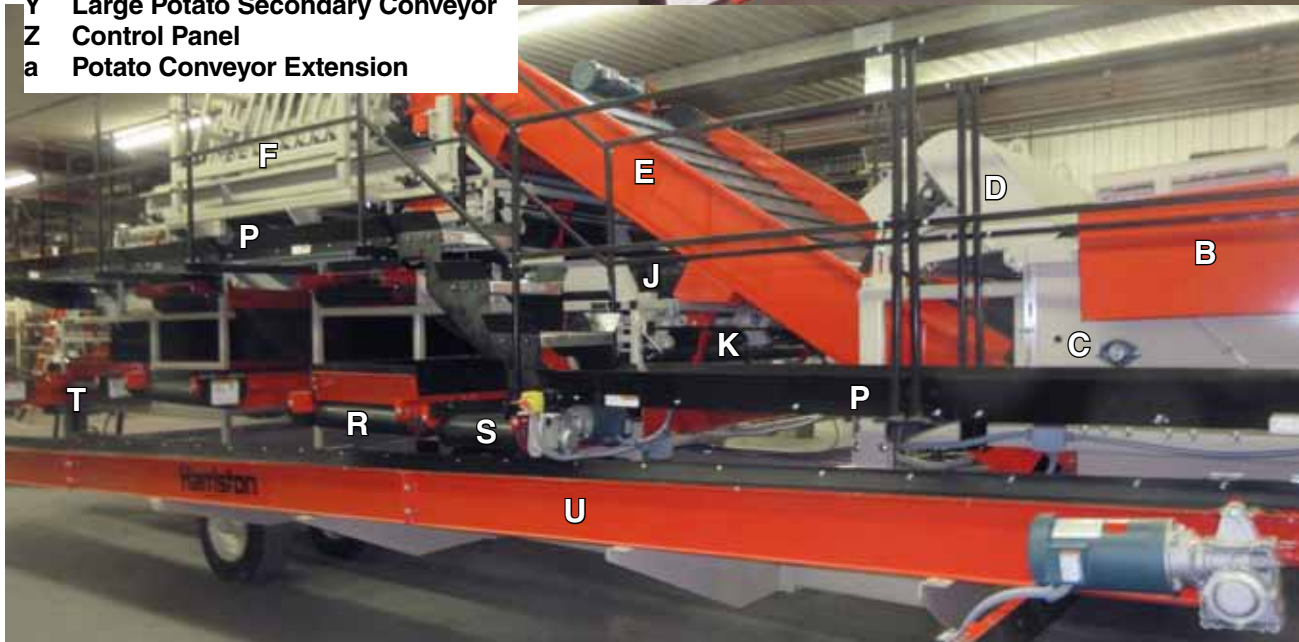


FIG. 1A MACHINE COMPONENTS

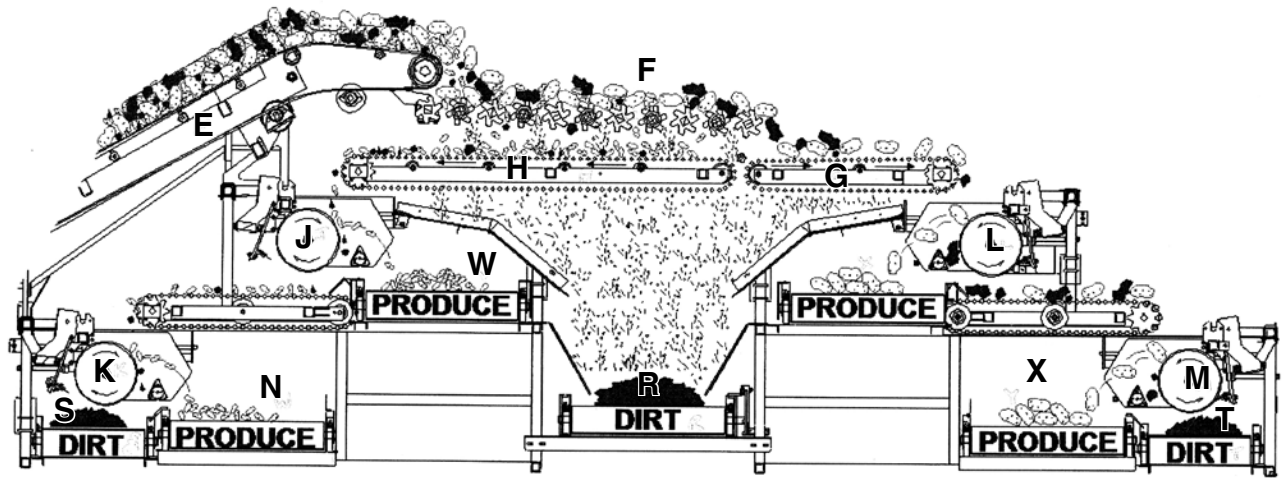




FIG. 1B MACHINE COMPONENTS

4.3 GENERAL OPERATION THEORY

A Model 4240 Clod Hopper is positioned in a line of conveyors moving potatoes into a storage facility or shipping vehicle. It is used to remove stones, dirt and trash from the potatoes.

Potatoes are loaded into the hopper elevator where they move across the Ellis table where dirt and trash are removed. They also move over an optional peg belt trash remover and blower to remove vines and stems if so equipped. The partially cleaned potatoes are conveyed up to the sizing table where they are separated into streams of large and small sizes.

Use the spacing on the sizing table to maintain an equal quantity of potatoes in each stream. Each stream of potatoes is directed over a separator roller system to remove most of the remaining trash. Cross conveyors move the clean large and small potatoes to the left side for discharge.

The trash stream is conveyed to move across a secondary separator roller to remove the remaining trash. Approximately 80% of the trash is removed as the potatoes move across the first roller and the final roller removes the rest. Attach appropriately conveyors to move potatoes to and from the Clod Hopper.

Minimize all drop heights to prevent bruising of the potatoes.

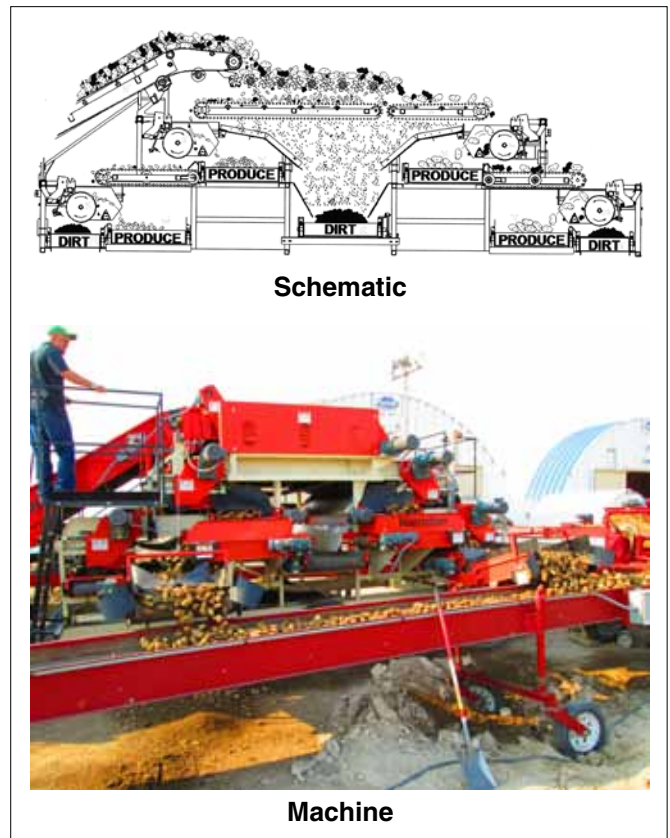


FIG. 2 OPERATION (TYPICAL)

4.4 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. Read Clod Hopper and auxiliary equipment manuals before starting.

B. After operating for 1/2 hour:

1. Re-torque all other fasteners and hardware.
2. Check that all electrical connections are tight and cords are routed out of the way or protected.
3. Check for hydraulic leaks. Tighten any leaking fittings.
4. Check the tension and alignment of all drive belts and chains. Align or tighten as required.
5. Check the alignment and tension of all conveying belts. Realign or tighten as required.
6. Check oil level in each speed reduction gear box for each drive. Top up as required.
7. Lubricate all grease fittings.

C. After 2, 5 and 10 hours of operation:

1. Re-torque all fasteners and hardware.
2. Check that all electrical connections are tight and cords are routed out of the way or protected.
3. Check for hydraulic leaks. Tighten any leaking fittings.
4. Check the alignment and tension of all conveying belts. Realign or tighten as required.
5. Check oil level in each speed reduction gear box for each drive. Check the level daily or more often if any are leaking. Top off as required.
6. Then go to the regular servicing and maintenance schedule as defined in the Maintenance Section.

4.5 PRE-OPERATION CHECKLIST

Safe and efficient operation of your new Clod Hopper requires that each operator reads and follows all safety precautions and operating procedures contained in this section. Performing the following pre-operation checklist is important for personal safety as well as for continued mechanical soundness and longevity of your new Harriston Clod Hopper. The checklist should be performed before operating the machine and prior to each operation thereafter.

1. Lubricate the machine according to the schedule prescribed in the "Maintenance Section".
2. Insure that proper protective gear is in good repair and available for use by each operator. Make certain that each operator uses the protective gear. Protective gear includes but, is not limited to:

- Leather gloves
- Safety glasses or face shield
- Full length protective clothing
- Steel toed boots with slip resistant soles.



3. Insure that all safety guards and shields are in good repair and securely in place.
4. Check that all conveying belts are properly tensioned and aligned. Adjust if required.
5. Check the tension and alignment of all drive belts and chains. Tension or align as required.
6. Check for hydraulic leaks. Tighten any leaking fittings.
7. Check oil level in each speed reduction gear box for each drive. Check the level daily or more often if any are leaking. Top off as required.
8. Check for and remove all entangled material.
9. Make sure that all electrical switches are in the OFF position before supplying power.
10. Check that all electrical connections are tight and cords are routed out of the way or protected.
11. Be sure the working area is clean and dry to prevent tripping or slipping.

4.6 CONTROLS

It is recommended that all operators review this section of the manual to familiarize themselves with the location and function of all machine controls before starting. Some machines may vary slightly due to custom features but they are similar and all controls are labelled.

1. Control Panel:

A panel on the left side of the frame holds all the controls for the machine. In most applications, this machine is part of a larger system that works together as a single unit. Review the controls for all machines in the system before starting. Review this section before starting to operate unit.

a. On Switch (Fig. 3):

This green push button latching switch turns the power ON to the machine. Depress the switch to start machine. Be sure all emergency stop switches are pulled out.

NOTE

The entire machine doesn't start all at once. When turned ON, a horn sounds for 3 seconds to alert personnel the unit is starting. Then dirt and potato conveyors start. Then sizing and rolls start. Then elevators, cleaning table, blowers and peg conveyors start. Machine is now running. The starting sequence takes 13 - 15 seconds.

b. Stop Switch (Fig. 3):

This red push button latching switch turns the power to the machine OFF. Depress the switch to stop machine. The switch must be pulled out before the machine can be started.

c. Forward/OFF/Reverse (Fig. 3):

This 3 position rotary switch controls the? Turn the switch fully counter-clockwise to run the ? forward direction. Turn switch to point up to turn it OFF. Turn fully clockwise to run in the reverse direction.

d. Lights ON/OFF (Fig. 3):

This 2 position rotary switch controls the power to the auxiliary lights mounted on top of the frame. Turn clockwise to turn ON and counter-clockwise to turn OFF.

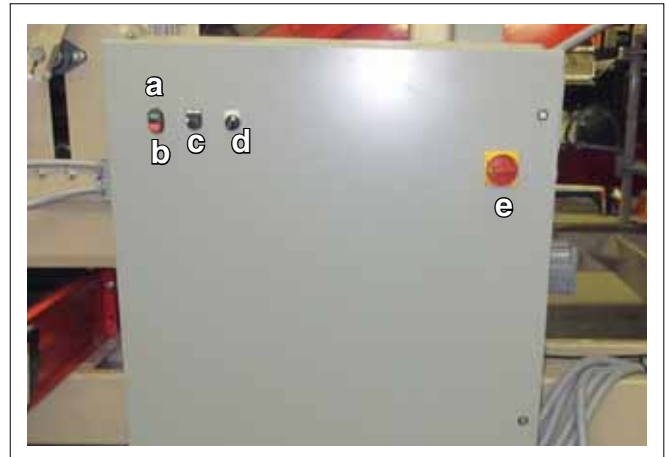


FIG. 3 CONTROL PANEL

e. Master ON/OFF Switch (Fig. 3):

This red 2 position rotary switch controls the power to the machine. Position the pointer UP to provide power to the controller. Position the pointer horizontally to turn the power OFF. Pointer must be pointing UP for the machine to have power and operate. Always turn power OFF for storage or when not being used for a period of time.

NOTE

All red emergency stop switches must be out (released) before the machine will run.

2. **Remote Stop Switch (Fig. 4):**

The machine is designed with a stop switch on the opposite side of the frame and right rear corner to allow personnel standing next to the trash conveyor to stop the machine. Push the switch IN to stop the machine. The switch must be OUT before the unit can be started. Turn the switch clockwise to release it and it will pop out.

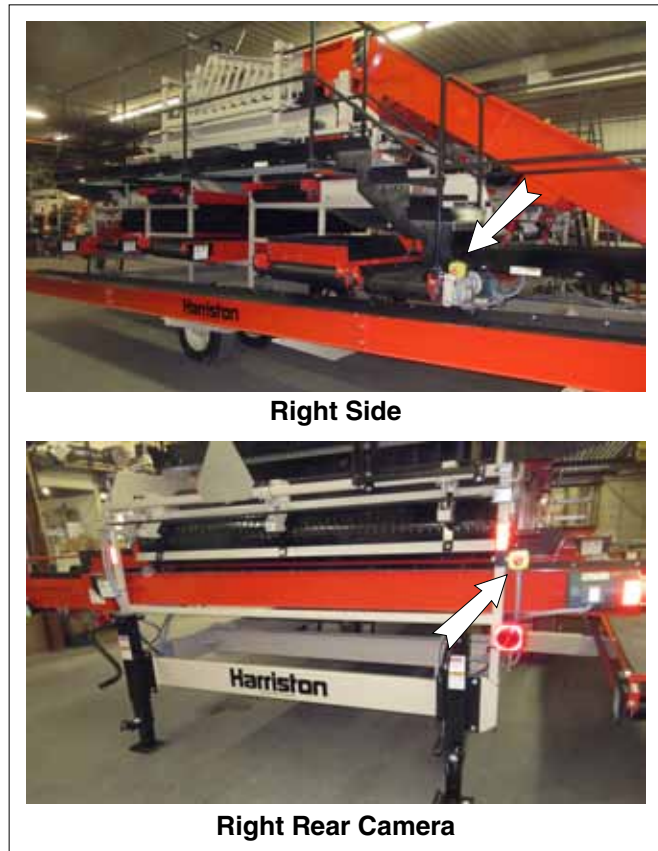


FIG. 4 RED REMOTE STOP SWITCH (TYPICAL)

3. **Auxiliary Equipment:**

Each customer must provide a means of bringing a flow of potatoes to the loading end and removing them from the discharge end plus removing the trash. Normally this is done by another piece of equipment such as another conveyor. Always connect the adjacent equipment securely to the hopper or conveyor to prevent movement.



FIG. 5 AUXILIARY EQUIPMENT

4. **Sizing Table Spacing:**
This turnbuckle sets the spacing between shafts in the sizing table. Extend the turnbuckle to increase the spacing and retract to reduce the spacing.

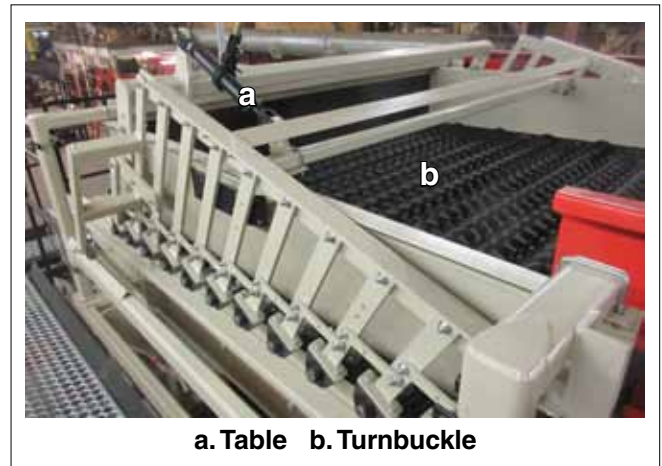


FIG. 6 SIZER TABLE SPACING

5. **Discharge Angle:**
This winch is used to change the clean potato discharge conveyor angle. Turn clockwise to increase the angle and counter-clockwise to decrease.

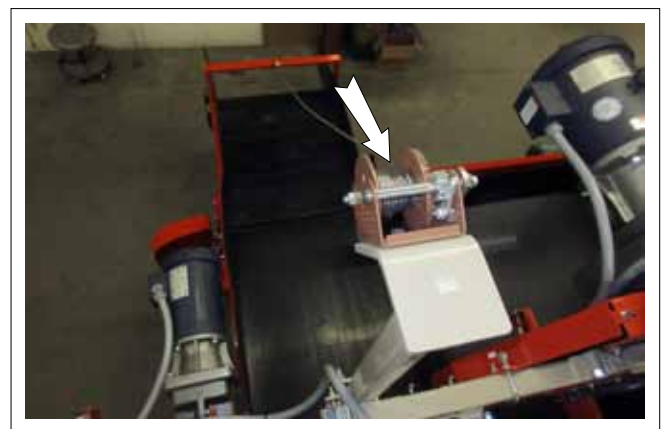


FIG. 7 DISCHARGE CONVEYOR ANGLE

6. **Hopper Position Jack:**
This hydraulic jack provides oil to the 2 cylinders that set the height of the input hopper. Move the control valve lever to the vertical position to raise the hopper and to the horizontal to lower it. Set vertically to lock in position.



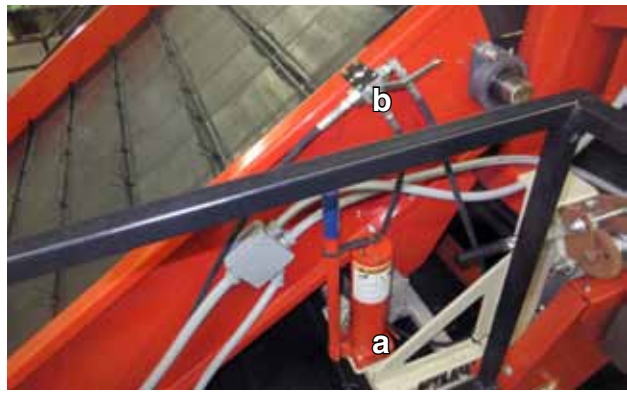
FIG. 8 HOPPER POSITION JACK CONTROL LEVER

7. **Roll Scrapers:**

Each roller is designed with scrapers that allow operating personnel to clean the roller if it develops a build-up of debris. Front rolls for the small potatoes are designed with hydraulically positioned scrapers and the rear rolls are set manually and spring-loaded.

a. **Front Rolls (Small Potatoes):**

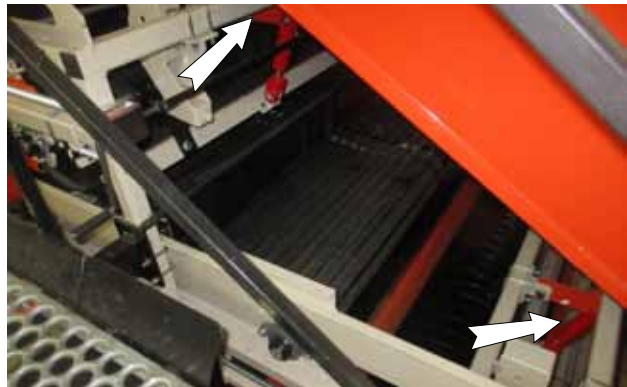
- Use the hand hydraulic jack to position the scraper on each roll.
- Close the relief valve on the jack base.
- Turn the selector valve handle to the right or left to direct the flow to the upper (primary) or lower (secondary) roll scraper position cylinders.
- Use the jack to position the scraper to keep the roll free of debris.



a. Relief Valve b. Selector Valve



Left Side Cylinders



Right Side Cylinders

FIG. 9 FRONT ROLL SCRAPERS

b. **Rear Rolls (Large Potatoes):**

- Use the position bolts on the scraper mounts to set the scraper position.
- The compression spring will keep the scraper-to-roll pressure constant.



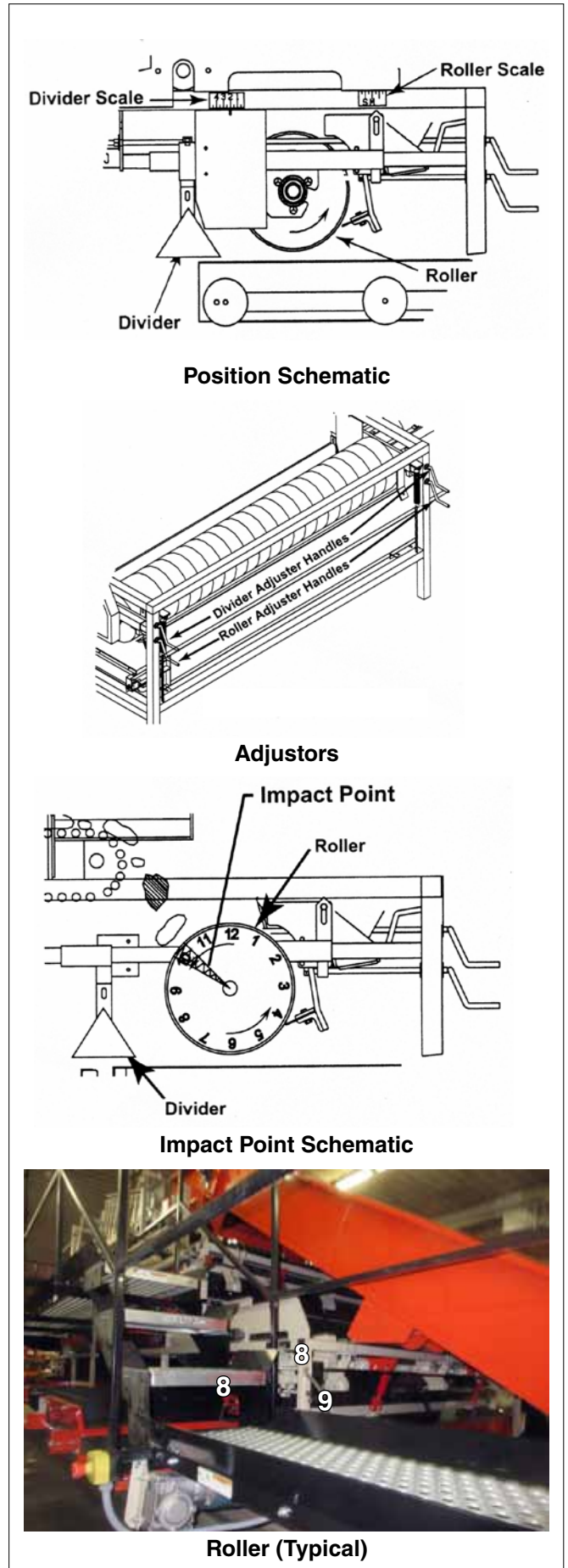
FIG. 10 REAR ROLLS (TYPICAL)

8. **Divider Position:**

Each roller is designed with a divider behind it to separate trash from potatoes after they bounce off the roller. Use the adjusting lever to move and position each divider appropriately for its roller.

NOTE

The divider has a triangular shape and can be turned as required. Pull the anchor bolt out, turn divider and install anchor bolt.



9. **Roller Position:**

Each roller is mounted on an adjustable base allowing it to move relative to the conveyor. The roller should be positioned so the potatoes hit the roller at the 10:00 o'clock position for the most effective separating. Use the adjusting bolt to position it appropriately for the size of the potato.

FIG. 11 DIVIDER / ROLLER

4.7 MACHINE SET-UP

The Clod Hopper must be properly set-up and prepared prior to operation. Follow these instructions when preparing the machine:

1. **Work Area:**

The work area should be open, firm, clean and level. It also must have adequate room for all functions associated with the Clod Hopper (unloading of potatoes, removal of debris and exporting of clean potatoes.).

2. **Night Operation:**

If the Clod Hopper is to be operated at night, adequate lighting must be supplied to the area. Be sure all cords are routed so as not to interfere with any of the functions performed in the work area. Adequate protection of the cords and wiring must be provided when people or equipment must go over the cords or wiring.

3. **Hitch:**

The Clod Hopper is equipped with a tow hitch with steerable wheels for towing. It does not need to be removed prior to the Clod Hopper being used; however, all workers must be reminded of its existence and potential tripping hazard.

4. **Machine Preparation:**

- a. Clear the area of bystanders, especially small children.
- b. Position the machine in a location with sufficient space for the Clod Hopper and enough clearance for trucks to unload and conveyors to remove clean potatoes and trash.
- c. Position machine at the desired location.
- d. Use the jacks to lift the frame and remove the weight from the tires. Use the jacks to level the frame from side to side and with the input end slightly higher than the discharge end.
- e. Place planks or blocks under the jacks for extra support if the ground is soft.

IMPORTANT

Chock all the wheels if they support the weight of the machine to prevent machine movement.

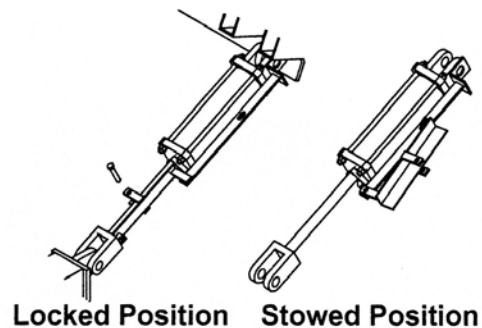
- f. Remove both transport cylinder locks and place in the stowed position. Adjust the hopper to the desired height.



Hitch



Removed (Operating)



Schematic



Cylinder Lock

FIG. 12 MACHINE PREPARATION

5. Move the hopper to the required height and position.
6. Move the input and removal conveyors into position to bring potatoes to the input hopper, remove debris from the trash conveyor and potatoes from the clean produce conveyor. Be sure to secure them to the Clod Hopper or anchor in position to prevent movement or separation.

IMPORTANT

It is recommended that a conveyor be used to move the produce from the field transport trucks to the input hopper. This distributes the flow of material more evenly across the width of the machine for maximum capacity.

7. Have a licensed electrician provide power to the machine and auxiliary equipment. Be sure the power is at the required voltage and amperage and complies with ANSI/NFPA 70. Protect the power cords to prevent damage.
8. When the first potatoes go through the machine(s), check and be sure the drop points between each machine are set to a minimum to prevent bruising. Adjust each machine to provide minimum drop.
9. Keep the working area clean and dry to prevent slipping and tripping.



Trash



Clean Potatoes

FIG. 13 AUXILIARY CONVEYORS



FIG. 14 DROP HEIGHT

4.8 OPERATING



OPERATING SAFETY

- Read and understand this Operator's Manual before operating, maintaining, adjusting, or repairing.
- Stop machine, disconnect power lines, and wait for all moving parts to stop before servicing, adjusting, maintaining, repairing, or cleaning.
- If removed for servicing, install and properly secure all guards and shields before operating.
- Keep hands, feet, hair, and clothing away from all moving parts.
- Clear the area of bystanders, especially small children, before starting.
- Using the jacks, raise the machine until the weight is off the tires; then level the frame. If the machine's weight remains on the tires, the tires must be chocked to prevent movement.
- Have a certified electrician provide electrical power to the machine.
- Disconnect power lines or shut off power source before opening panel or working on electrical components. High voltage can cause electrocution.
- Do not stand between the hopper and any vehicle backing up to the hopper. Keep others away.
- Keep the working area clean and dry.
- Review safety instructions annually.
- Make certain that you are in compliance with local, state/provincial, and federal regulations regarding transporting agricultural equipment on public roadways.
- Make certain that all wheels and tires are in good repair and that tires are inflated to proper pressure. Do not under-inflate or overinflate.
- Make certain that all wheel lug bolts are tightened to proper torque specifications.
- Install the transport cylinder locks on the input conveyor and secure.
- Add extra lights and use pilot vehicle(s) when transporting during times of limited visibility.
- Wrap up and bind all electrical wires to the frame.
- Be sure that any necessary SMV (slow moving vehicle) signs, reflectors, and lights required by law are in proper place and are clearly visible to all traffic.
- Be sure the tow vehicle has adequate capacity and weight to safely tow the Clod Hopper.
- Be sure to positively hitch to the towing vehicle. Use a retainer on the pin and a safety chain to assure a safe hitch hook-up when transporting.
- Adhere to local regulations regarding maximum weight, width, and length.
- Do not exceed 20 MPH (32 kph). Reduce speed on rough roads and surfaces.
- Do not allow anyone to ride on the Clod Hopper or towing vehicle during transport.
- Always use hazard flashers on the towing vehicle when transporting.

Follow this procedure when using the Clod Hopper:

1. Review Section 4.7 - Machine Set-Up and be sure all auxiliary conveyors and equipment are positioned appropriately for the application.
2. Review and follow the pre-operation checklist (See Section 4.5).
3. Review the location and function of all controls (See Section 4.6).
4. Position the truck to unload and move the potatoes into the input hopper and primary elevator.



FIG. 15 UNLOADING

4. Starting Machine:

- a. Clear the area of bystanders. Know where everyone is before starting.
- b. Place all controls in the OFF position.

NOTE

Be sure the red Emergency Stop switches are pulled out.

- c. Turn the power to the machine ON at the master panel.
- d. Turn the conveyor ON that moves clean potatoes away from the machine.
- e. Turn ON the conveyors that remove trash from the machine.
- f. Turn the control panel switch ON (refer to section 4.6 Controls).

NOTE

The entire machine doesn't start all at once. When turned ON, a horn sounds for 3 seconds to alert personnel the unit is starting. Then dirt and potato conveyors start. Then sizing and rolls start. Then elevators, cleaning table, blowers and peg conveyors start. Machine is now running. The starting sequence takes 13 - 15 seconds.

- g. Start the conveyors that bring potatoes to the hopper.
- h. Load potatoes into the conveying system that brings them to the hopper.

5. Stopping Machine:

- a. Turn OFF the equipment that moves the potatoes to the hopper or primary elevating conveyor.
- b. Wait until the potatoes have moved through the separating and conveying systems.
- c. Turn the Clod Hopper OFF.
- d. Turn the conveyors OFF that move potatoes and debris away from the machine.
- e. Operator must turn all controls OFF.

An alternative is to depress the red Emergency Stop button on the typical control panel but then the operator must go through steps a through to turn all the controls OFF before restarting.



FIG. 16 CONTROL PANEL



Right Side



Rear

FIG. 17 EMERGENCY STOP SWITCH

6. Emergency STOP:

Depress the large red STOP button on the control panel or right side of frame. This will stop the conveyors. Be sure to turn all the individual controls OFF and pull out the Emergency Stop buttons before restarting the machine.

7. **Equipment Attachment:**

Provide a means for bringing a flow of potatoes into the hopper and elevating conveyor, and a means of removing clean potatoes and trash from the discharges. Since the machine is positioned on the ground for operation, it will not move. Do not allow the auxiliary equipment to move. Normally, connecting them will prevent movement.



Hopper



Clean Potatoes



Trash

FIG. 18 AUXILIARY CONVEYING EQUIPMENT (TYPICAL)

8. **Conveying Speed:**

The conveyors of the Clod Hopper and associated conveyors run at a constant speed appropriately for the separating and cleaning process.

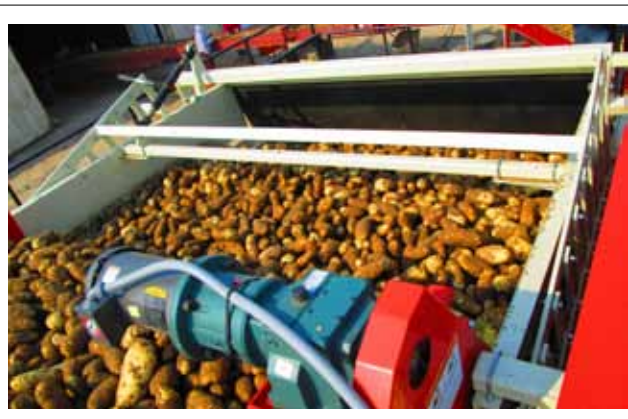


FIG. 19 CONVEYING SPEED (TYPICAL)

9. **Ellis Cleaning Table:**

The potatoes from the field are loaded into the hopper, onto the elevating conveyor and then over the Ellis table to remove as much dirt as possible. The shaft spacing on the Ellis table is preset at the factory and can't be changed. Potatoes should only be placed over the Ellis table one layer at a time so the maximum amount of dirt and debris is removed.

10. **Cleaning Belted Chain Conveyor:**

A belted chain conveyor is positioned directly behind the Ellis table to remove additional dirt and debris.

11. **Ellis Table Adjustments:**

Each Ellis table is designed with 3 adjustments to allow it to be set appropriately for all potential types of applications.

- a. A turnbuckle (A) is located on the front corners of the frame. The front of the frame is set at the factory 2 inches (50 mm) higher than the rear and determines the speed the potatoes move over the table. Extend the turnbuckles and raise the front of the frame to increase the speed of the potatoes over the table if they are relatively clean and free of debris. If very dirty, lower the front to allow the flow to remain longer on the Ellis table to provide a more thorough cleaning. Monitor the condition of the potatoes moving off the table. Always set the cleaning table angle to get maximum cleaning.
- b. The shaft spacing (B) making up the Ellis cleaning table can also be adjusted to accommodate potatoes of different sizes. Turn adjuster bolts on each side clockwise (C) to reduce the spacing and counter-clockwise to widen the spacing. Widen the shafts to remove more dirt or small potatoes.
- c. The rollers are designed with scrapers (D) to remove mud if it builds up. Tighten scrapers if mud builds up on the rollers and back off if they remain clean. If the scrapers do not keep the rollers clean, periodic manual cleanings may also be required.



FIG. 20 ELLIS TABLE

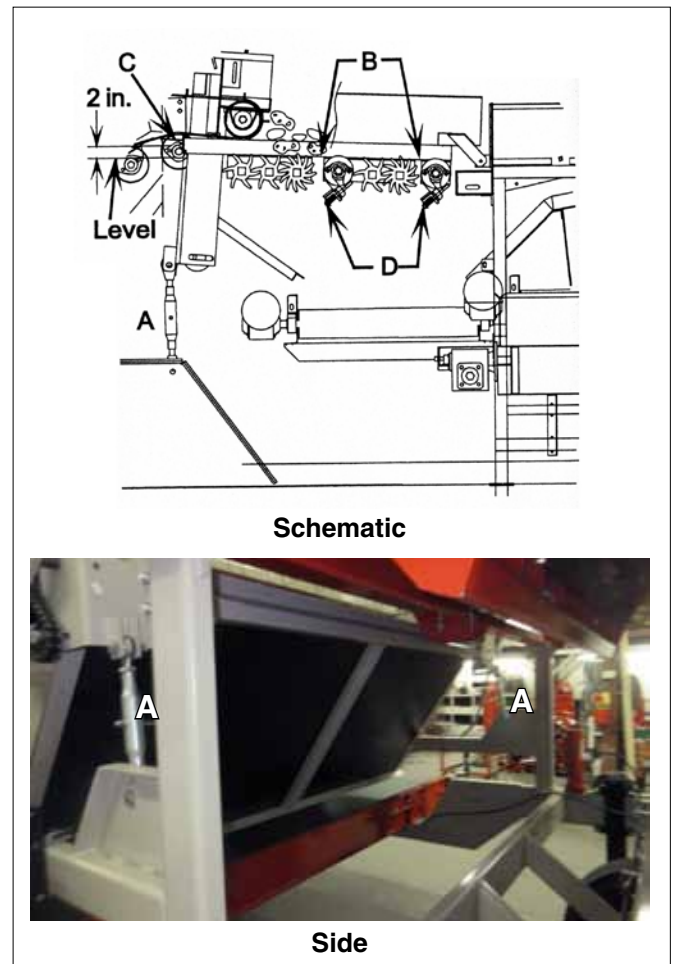


FIG. 21 ELLIS TABLE ADJUSTMENT

12. **Peg Belt (Optional):**

An optional Peg Belt can be installed behind the Ellis cleaning table and rod conveyor to remove vines, stolen and other debris. The vines and stolen get caught in the pegs and are removed from the flow of material.

Use the brackets on the left side of the frame to adjust its angle to remove more vines as the potatoes pass. Monitor how many vines remain in the flow and adjust as required.

13. **Blower (Optional):**

If the machine is equipped with an optional peg belt for removing vines and stolen, it will also be equipped with a blower to blow the light vines into the peg belt for removal. The angle of air flow can be changed to provide the best results as required. Monitor the cleanliness of the potatoes and adjust the peg belt and blower angles appropriately to give the best results.

NOTE

Change blower speed by adjusting the VFD (Variable Frequency Drive) inside the control box.



Peg Belt - Right Rear



Blower Angle - Left Side



Variable Frequency Drive (VFD)

FIG. 22 PEG BELT / BLOWER

14. **Secondary Elevating Conveyor:**

A second elevating conveyor is positioned behind the Ellis cleaning table and rod conveyor. It is used to move potatoes up to the sizing table.



FIG. 23 SECONDARY CONVEYOR

15. **Sizing Table:**

Each machine is designed with a Star sizing table directly behind the secondary elevating conveyor to separate the stream of potatoes into large and small sizes. The best results are obtained when the potatoes are divided into two equal flows to provide for the most efficient cleaning.

Use the turnbuckle on the right side of the table to adjust the table shaft spacing and keep the amount of potatoes equal in each flow. Adjust shaft spacing to allow the small potatoes (1/2 volume) to go through the table.



FIG. 24 SIZING TABLE

16. **Cleaning Rod Conveyor:**

Two belted chain conveyors are located under and behind the sizing table to remove more dirt and debris from the flow of potatoes as they are moved to the rolls.

- a. Large potato.
- b. Small potato.

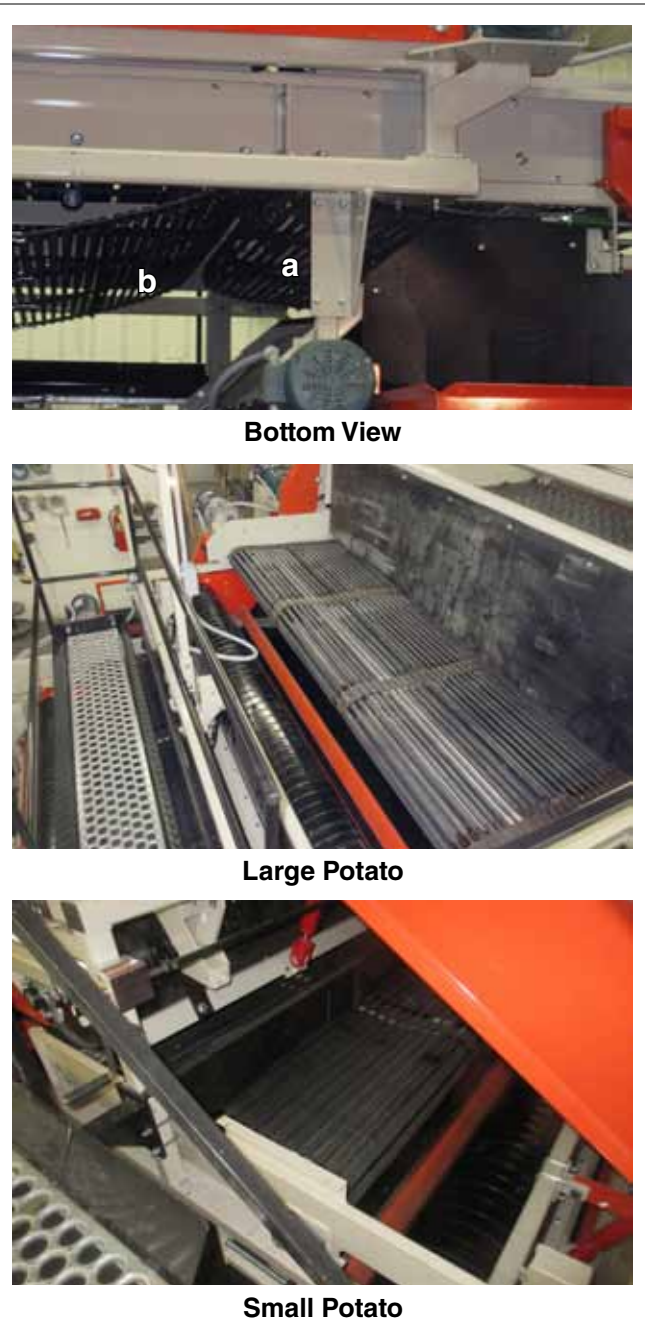


FIG. 25 CLEANING ROD CONVEYOR

17. **Rolls:**

The Model 4240 Clod Hopper is designed with 4 rolls to clean the small, large and debris stream of product. After the sizing table separates the flow of potatoes into the large and small sizes, each one is directed over a set of rolls to remove clods, stones and debris. The resulting debris stream also goes over another roll to remove the remaining potatoes. The large and small streams go over the primary rolls and the debris stream goes over the secondary roll.

Each roll can be moved relative to the end of its conveyor using the handle on one end of the frame. Each handle is connected to the adjuster on the other side of the frame through a threaded rod. Start with the "M" setting and adjust as required. Be sure to direct the stream of potatoes to impact the roll at the 10:00 to 10:30 position for best results.

- A. Large potato primary roll.
- B. Large potato secondary roll.
- C. Small potato primary roll.
- D. Small potato secondary roll.

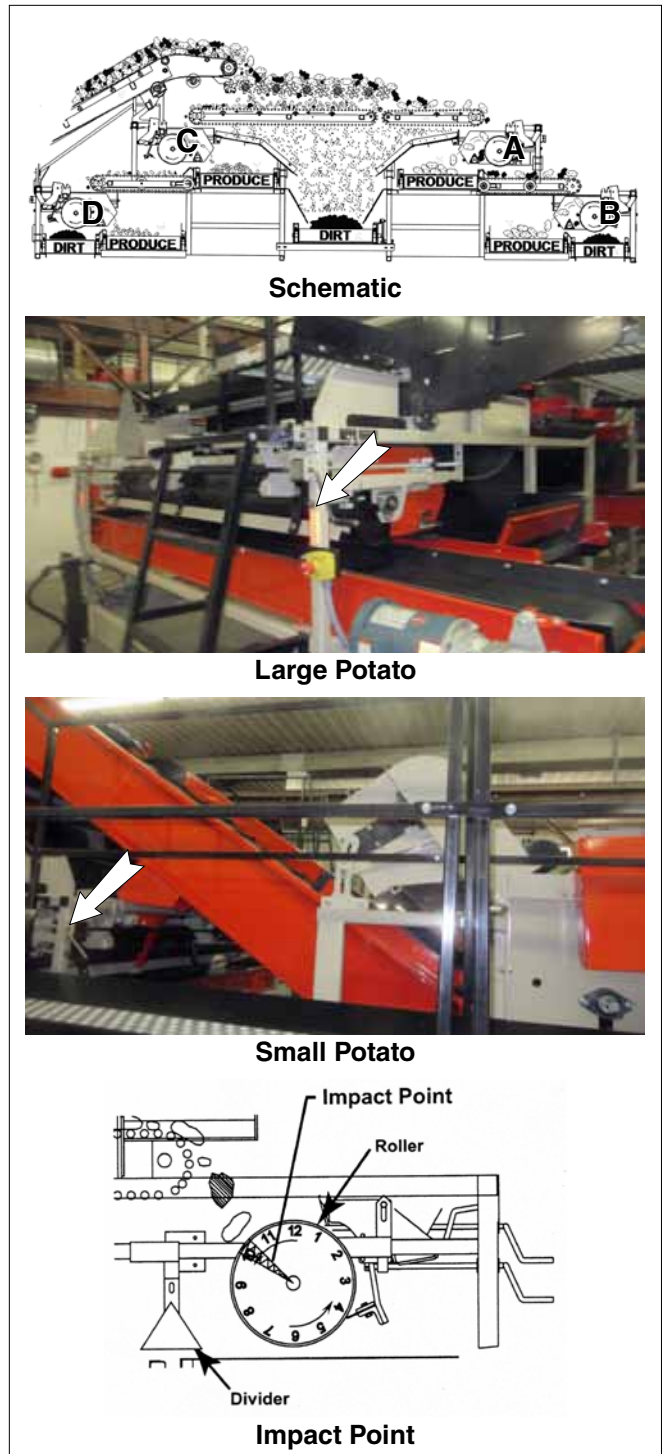


FIG. 26 ROLLS (TYPICAL)

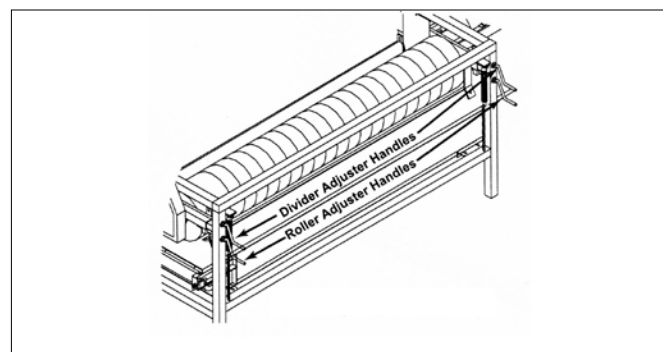


FIG. 27 ROLL POSITION ADJUSTMENT

18. Roller Action:

The Clod Hopper works on the principle that potatoes are more elastic than stones, clods or other debris and will rebound further off the roller after impact. For the best results the potatoes should impact the roller at the 10:00 to 10:30 position. The divider must be set to direct the potatoes onto the clean conveyor and the clods onto the trash conveyor. Watch the rebound area and set the position of the divider to direct the material to the appropriately conveyor.

19. Divider:

Each roller is designed with a divider to direct and separate the potatoes and debris after impact. Start with the divider set on #2 and move as required to provide good separation. If the divider gets dirty or covered with mud, it can be turned in 120° increments. To rotate divider, pull out on spring pin, rotate divider and release pin to seat in divider.

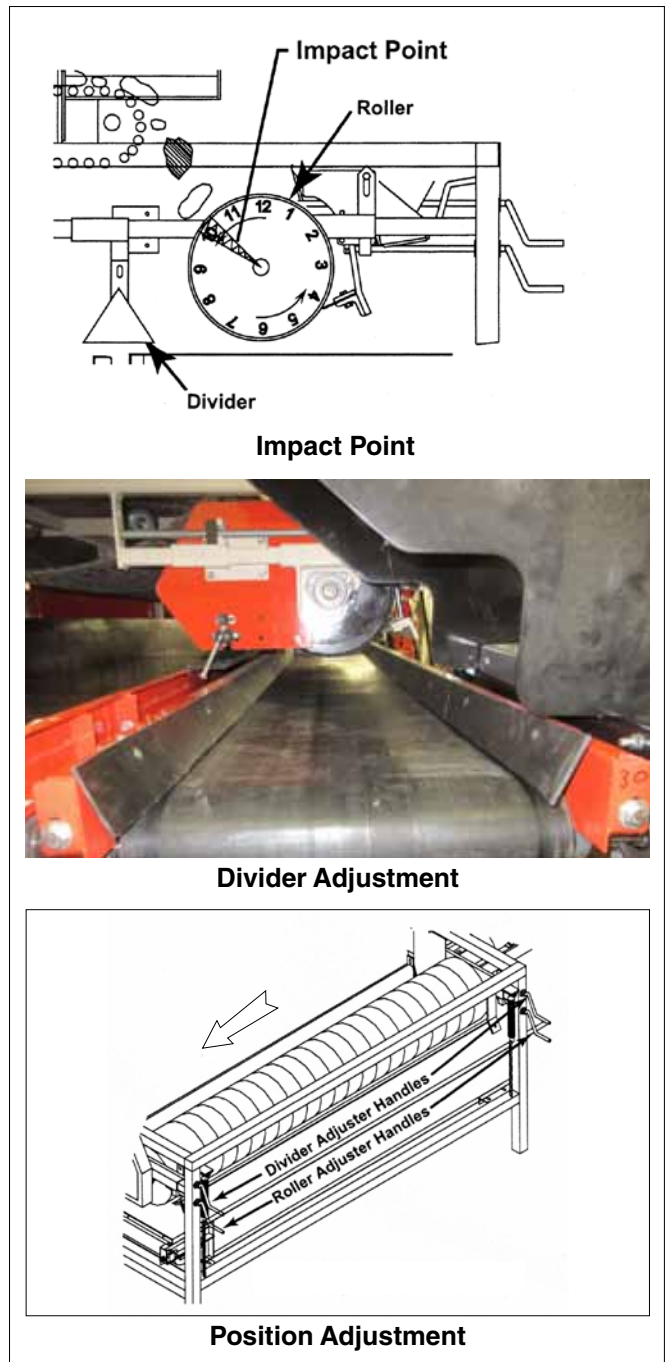


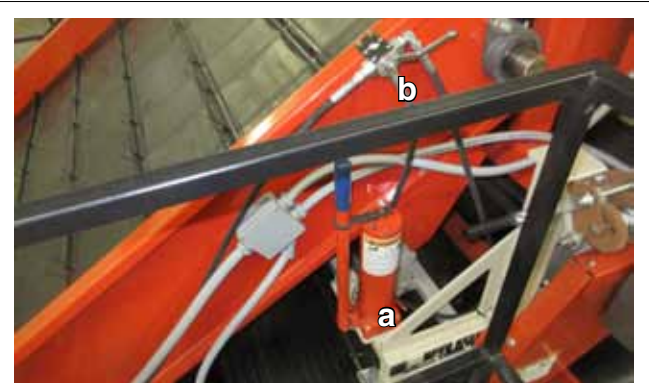
FIG. 28 ROLL ACTION

20. **Roll Scrapers:**

Each roll is equipped with a scraper to keep the roll clean. Adjust as required to keep the rolls clean. Do not over-clean and damage the roll. Just set the scraper to slightly contact the roll. Use the handles to set the position and spring tension on the scraper.

a. **Small Potato - Front:**

Each small potato roll is designed with scrapers that are positioned with hydraulic cylinders. Use the hand jack next to the platform on the left side of the frame. Use the valve to select which roll and scraper will be adjusted. Once the scraper is positioned, monitor it and reposition if debris builds up on the roll.



a. Valve b. Hand Jack



a. Roll b. Position Cylinder

FIG. 29 SMALL POTATO ROLL SCRAPERS (TYPICAL)

b. **Large Potato - Rear:**

Each large potato roll is designed with spring-loaded scrapers to keep them clean. Reset when debris builds up on the roll.

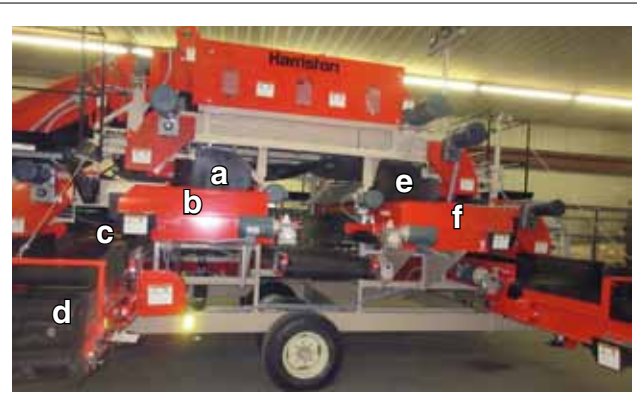


FIG. 30 LARGE POTATO ROLL SCRAPERS (TYPICAL)

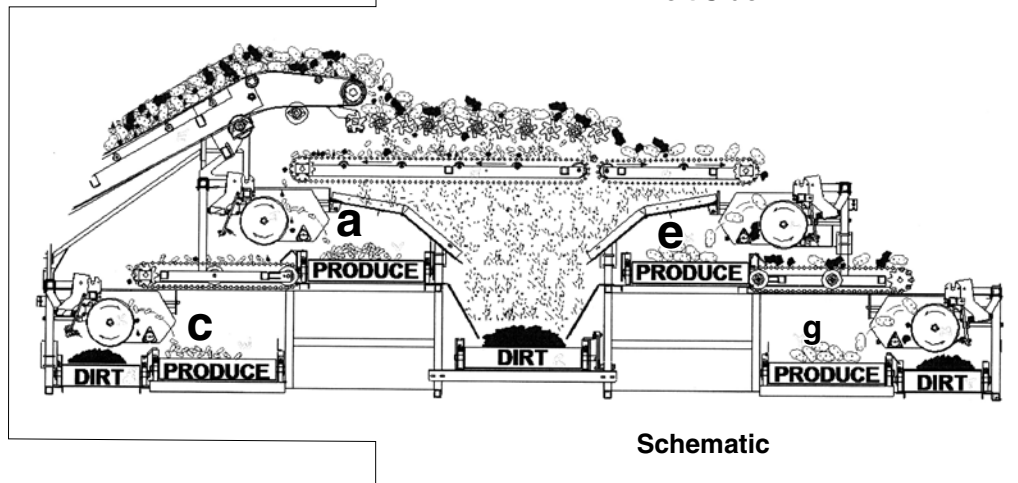
21. **Clean Potato Conveyors:**

The machine is designed with clean potato conveyors next to each roll, along the left side of the frame and the discharge.

- a. Small potato primary.
- b. Small potato collector.
- c. Small potato secondary.
- d. Small potato discharge.
- e. Large potato primary.
- f. Large potato discharge.
- g. Large potato secondary.
- h. Large potato discharge.



Left Side



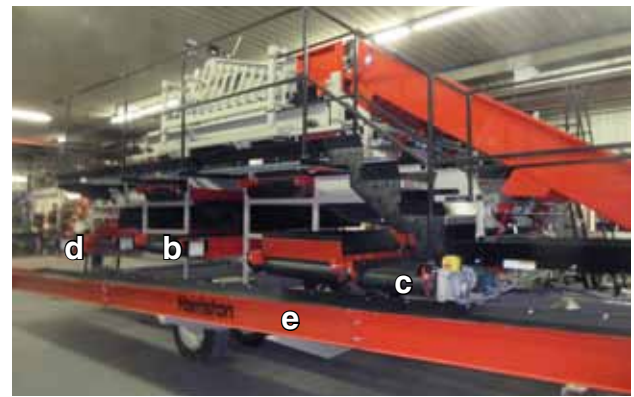
Schematic

FIG. 31 CLEAN POTATO CONVEYORS (TYPICAL)

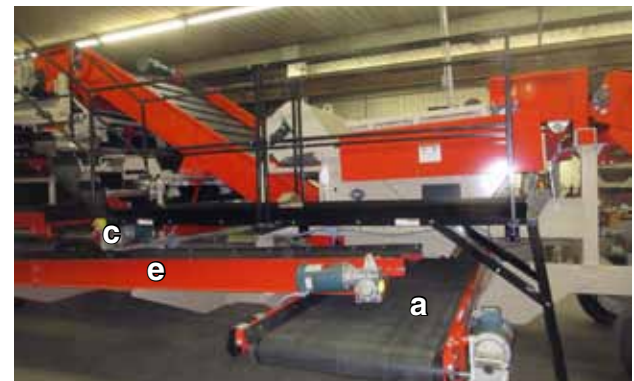
22. Debris / Trash Conveyors:

The Clod Hopper is designed with debris/trash conveyors that extend under the complete machine to gather and remove all the debris, trash, rocks and other foreign material. They are positioned under the Ellis table and rod conveyor; one under the rod conveyor after the second elevating conveyor, next to each roller/divider system and a trash discharge conveyor.

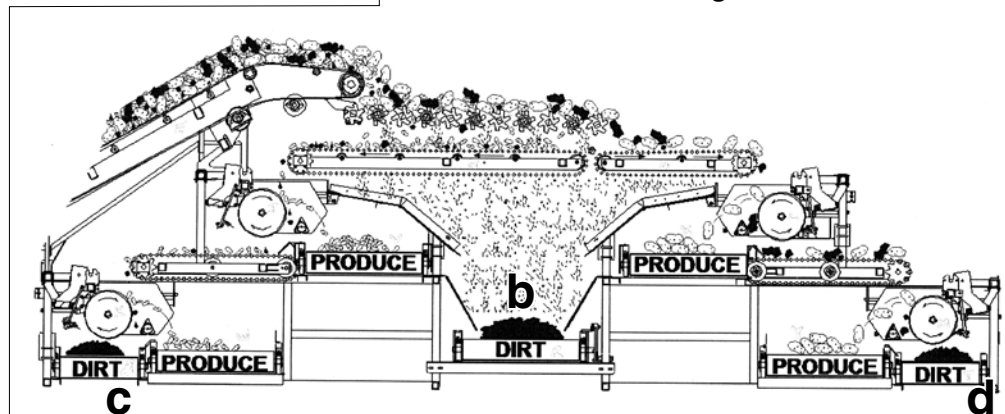
- a. Under Ellis table.
- b. Under separating table.
- c. Under small potato cleaning system.
- d. Under large potato cleaning system.
- e. Along right side of frame to collect trash into one stream.



Right Side



Front - Right Side



Schematic



Workplace

FIG. 32 DEBRIS / TRASH COLLECTORS

23. Bruising:

Potatoes are sensitive to bruising during the gathering, transporting and handling phases of harvesting. Bruising is kept to a minimum by maintaining a full flow of potatoes through each machine and minimizing all drop heights. Bruising during the storage phase can be minimized by keeping the drop height between each machine and discharge as small as possible.



Discharge

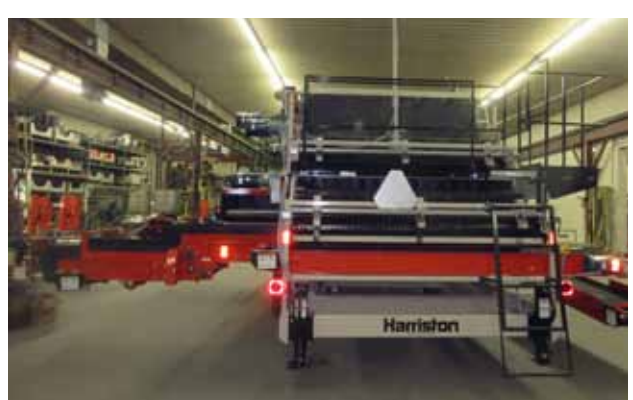


Working

FIG. 33 DROP HEIGHT

24. Sorters:

The Clod Hopper is designed with the right side dirt conveyor close to the ground to allow sorters/ personnel to stand next to the machine and move good potatoes from the trash to discharge conveyors. Do not allow any personnel to have unrestrained long hair, loose clothing or jewelry when working on the machine.



Discharge



Working

FIG. 34 SORTER POSITION

4.9 STORAGE



STORAGE SAFETY

- Store the Clod Hopper on a firm level surface.
 - If required, make sure the unit is firmly blocked up.
 - Make certain all mechanical locks are safely and positively connected before storing.
 - Store away from areas of human activity.
 - Do not allow children to play on or around the stored Clod Hopper.
 - Lock out power by turning off master control panel or junction box and padlocking the door shut to prevent electrocution or unauthorized start up of the Clod Hopper.
8. Inspect each conveyor. Check the condition of the rollers. Replace any if badly worn. Check the alignment of the conveyors. Align if required. Properly tension each conveyor belt.
 9. Touch up all paint nicks and scratches to prevent rusting.
 10. Select a storage area that is dry, level and free of debris.

4.9.1 PLACING IN STORAGE

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 beginning of the next season. Follow this procedure:

1. Check all rotating parts for entangled material. Remove.
2. Turn the power OFF at the master electrical panel and lock out.
3. Unplug and remove power cord from machine.
4. Thoroughly wash the machine using a pressure washer to remove all dirt, mud, debris or residue.
5. Lubricate all grease fittings. Make sure all grease cavities have been filled with grease to remove any water residue from the washing.
6. Inspect all the hydraulic hoses, lines and fittings. Tighten any loose fittings. Replace any hose that is badly cut, nicked, abraded or separating from a fitting. Replace any damaged components.
7. Inspect all the electrical cords, lines, junction boxes and motors. Tighten any loose connections. Replace any cord that is badly cut, nicked or abraded. Replace any damaged components.

4.9.2 REMOVING FROM STORAGE

When preparing to use the machine at the start of the season, follow this procedure:

1. Move to the working area if appropriately.
2. Check
 - a. Electrical systems and hydraulic components.
 - b. All drive systems.
 - c. All hardware. Tighten as required.
3. Replace any defective components.
4. Go through the pre-operation checklist (Section 4.5) before starting.

4.10 TRANSPORT



TRANSPORT SAFETY

- Make certain that you are in compliance with local, state/provincial, and federal regulations regarding transporting agricultural equipment on public roadways.
- Make certain that all wheels and tires are in good repair and that tires are inflated to proper pressure. Do not under-inflate or overinflate.
- Make certain that all wheel lug bolts are tightened to proper torque specifications.
- Install the transport cylinder locks on the input conveyor and secure.
- Add extra lights and use pilot vehicle(s) when transporting during times of limited visibility.
- Wrap up and bind all electrical wires to the frame.
- Be sure that any necessary SMV (slow moving vehicle) signs, reflectors, and lights required by law are in proper place and are clearly visible to all traffic.
- Be sure the tow vehicle has adequate capacity and weight to safely tow the Clod Hopper.
- Be sure to positively hitch to the towing vehicle. Use a retainer on the pin and a safety chain to assure a safe hitch hook-up when transporting.
- Adhere to local regulations regarding maximum weight, width, and length.
- Do not exceed 20 MPH (32 kph). Reduce speed on rough roads and surfaces.
- Do not allow anyone to ride on the Clod Hopper or towing vehicle during transport.
- Always use hazard flashers on the towing vehicle when transporting.

Harriston Clod Hoppers are designed to be easily and conveniently transported from location to location. To transport the Clod Hopper, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Disconnect and remove all auxiliary equipment from the Clod Hopper.
3. Disconnect and remove the power lines. Wrap and secure excess power lines on the frame of the machine.
4. Raise the input conveyor and install the transport cylinder locks. Secure each with its retainer. Raise and secure folding conveyor with transport lock.
5. Fully raise each of the stabilizer jacks, lowering the machine onto the tires.
6. Fully raise the discharge conveyors.
7. Install and secure hitch.
8. Be sure to select an appropriately sized tow vehicle. Do not use an undersized/underpowered tow vehicle.
9. Be sure there is adequate room to back the tow vehicle up to the Clod Hopper. Back the tow vehicle slowly to the hitch. Stop the tow vehicle, set the park brake and turn off ignition.
10. Hitch the Clod Hopper to the tow vehicle. Check to be sure it is positively hitched and be sure to install a retainer.
11. Connect safety chains to tow vehicle to prevent unexpected vehicle separation.
12. Be sure all lights, reflectors, signs and SMV (slow moving vehicle) are clean, operational and clearly visible.

NOTE

Install optional lighting bar and connect the wiring harness to the tow vehicle.

5 SERVICE AND MAINTENANCE



MAINTENANCE SAFETY

- Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
- 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.
- Turn machine OFF, shut down and lock out power supply (safety lockout devices are available through your Harriston dealer parts department) and wait for all moving parts to stop before servicing, adjusting, maintaining or repairing.
- Do not work on Clod Hopper electrical system unless the power cord is unplugged or the power supply is locked out. Lock-out tag-out power source before performing any maintenance work.
- Always use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance.
- Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.
- A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
- Support the machine with wood blocking or safety stands when changing tires or working beneath the Clod Hopper. Do not use cement blocks.
- When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

5.1 SERVICE

5.1.1 FLUIDS AND LUBRICANTS

1. Grease

Use an SAE multi-purpose high temperature grease with extreme pressure (EP) performance meeting or exceeding the NLGI #2 rating for all requirements.

2. Speed Reducer Gear Box Lubricant

Use a Mobil Glygoyle synthetic lubricant 150 VG 460 or equivalent.

Capacity: 2 qts. (2 L).

IMPORTANT

Use only food grade oil in this machine.

5.1.2 GREASING

Refer to Section 5.1.1 for recommended grease. Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use only a hand-held grease gun for all greasing. Air powered greasing systems can damage the seals on bearings and lead to early bearing failure.
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 a fitting will not take grease, remove and clean thoroughly. Also clean lubricant passageway. Replace fitting if necessary.
5. **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.
6. **Sealed Bearings:**
Sealed bearings are used in all locations on the machine except for the steering swivel castor point bushings and at the discharge conveyor hinge pivot. **Do not grease any sealed bearings on the Clod Hopper.**

5.1.3 SERVICING INTERVALS

Monthly

The period recommended is based on normal operating conditions. Severe or unusual conditions may require more frequent servicing.

1. All gearboxes on the machine are filled with oil and sealed from the factory. Open the breather before using for the first time.

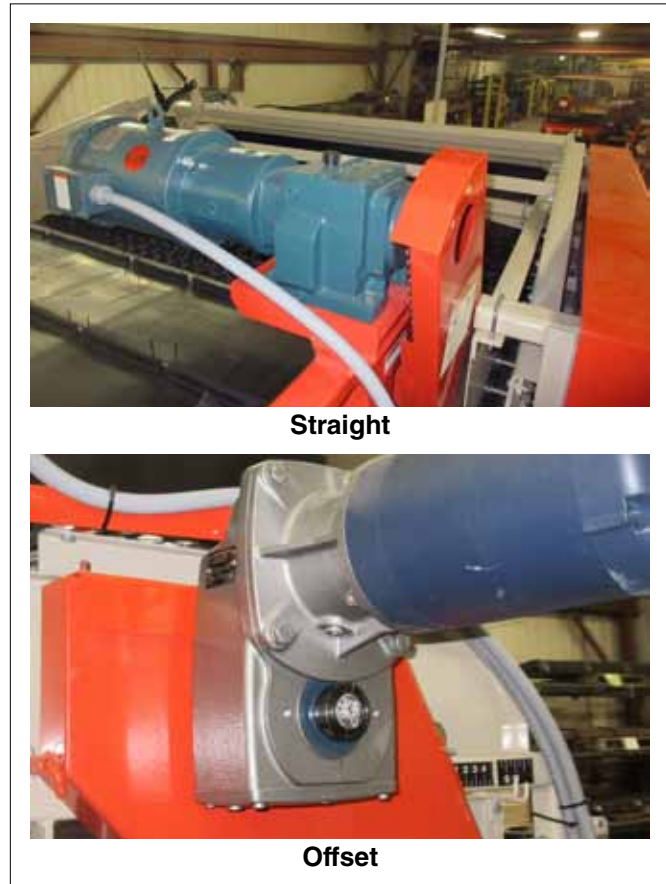


FIG. 35 GEARBOXES (TYPICAL)

2. Check the tension and alignment of conveyors.
 - a. Belted.

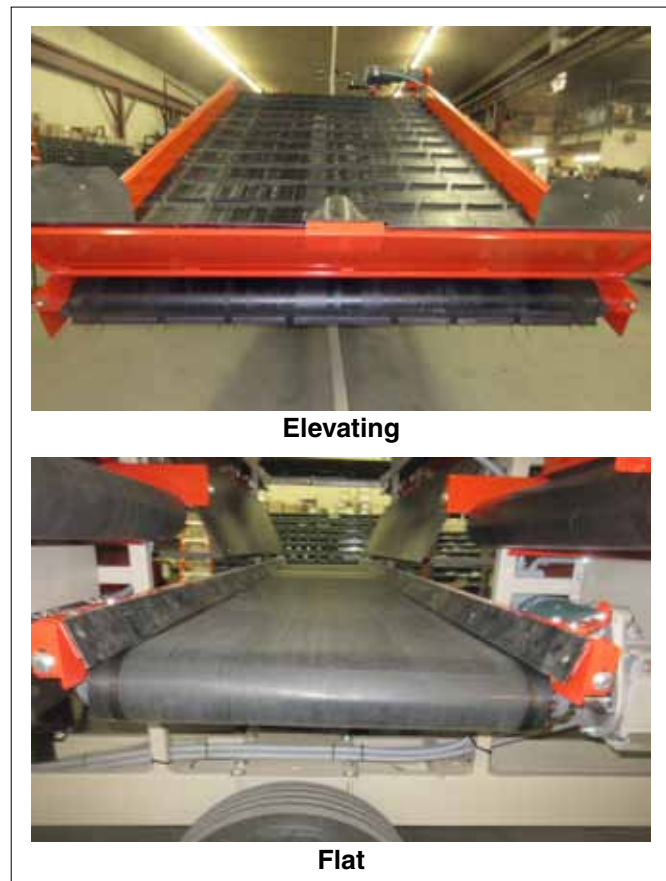


FIG. 36 BELTED CONVEYOR (TYPICAL)

- b. Belted chain conveyor.



FIG. 37 POTATO CHAIN CONVEYOR

- 3. Check the tension and alignment of drive belts and roller chains.

- a. Drive belts.



FIG. 38 DRIVE BELT

b. Roller chain drives.

 **WARNING**
Machine is shown with guards removed or opened for illustrative purposes only. Do not operate with guards removed or opened.

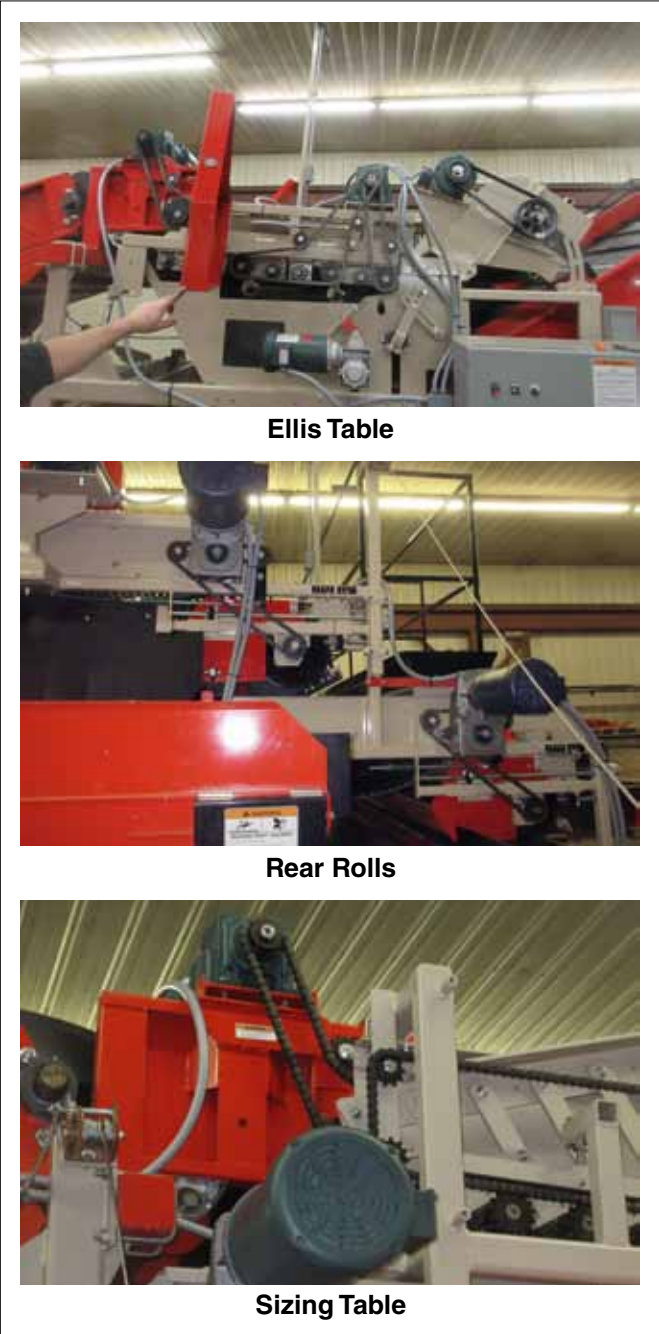


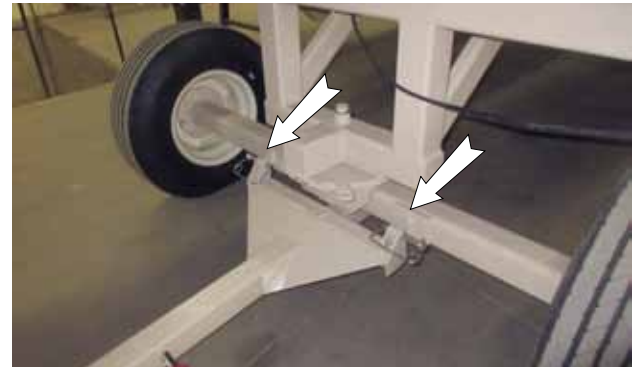
FIG. 39 ROLLER CHAIN DRIVES (TYPICAL)

500 Hours or Annually

1. Grease the fittings on the front swivel steering system.



Pivot Pin



Base

FIG. 40 STEERING CASTOR BASE

2. Grease discharge conveyor pivot (2 points each conveyor).



FIG. 41 DISCHARGE CONVEYOR PIVOTS (TYPICAL)

3. Apply a light coat of oil to roller chains.

 **WARNING**
Machine is shown with guards removed or opened for illustrative purposes only. Do not operate with guards removed or opened.



Ellis Table Drive



Sizing Table



Rear Rolls



Product Drives

FIG. 42 ROLLER CHAINS (TYPICAL)

4. Clean machine with a power washer.



FIG. 43 MACHINE

5.2 MAINTENANCE

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

5.2.1 ELECTRIC SYSTEM INSPECTION

Electricity provides power to all systems on the Clod Hopper. To maintain the integrity of each system and provide a safe working environment for the operator, it is important that a daily inspection be done to make sure that all systems and components are in good working condition. To provide a safe working environment, have a licensed electrician provide power to the machine.

When inspecting the electrical system and components, follow this procedure:

1. Place all controls in the OFF or neutral position.
2. Turn power OFF at the master panel and lock-out before starting the inspection.



WARNING

Do not operate the machine unless the master panel is equipped with a lock-out device. Always engage lock-out device before performing any maintenance work. Lock-out devices are available from your dealer or the factory.

3. Inspect all electrical components looking for:
 - a. Damaged plugs.
 - b. Frayed or loose wires.
 - c. Cut or cracked insulation.
4. Replace any damaged components immediately.
5. Be sure all components are grounded.
6. Be sure there is no water or moisture in any junction box or enclosure. Dry the components before turning power on. Be sure that all compartments seal properly when closed.

5.2.2 BREATHER CLEANING

Each gearbox is equipped with drain, level and fill plug. Some fill plugs are equipped with a breather that vents the internal pressure to atmosphere. As the gearbox temperature increases and decreases during the operating and stopped modes, the pressure in the gearbox will increase or decrease if it is not vented to atmosphere. An increase in internal pressure will cause the shaft seals to leak until the gearbox runs low on or out of oil. To check on or clean the breather, follow this procedure:

1. Place all controls in their OFF or neutral position.
2. Turn the power OFF at the master panel and lock-out tag-out.
3. All Nord gearboxes are designed with metric socket-head cap screws as drain plugs in the lowest part of the gearbox for ease of draining. The level fill plug is a hex head cap screw. Both types of plugs are equipped with gaskets to prevent oil leaks when tightened.
4. Remove the fill plug / Autovent breather from the gearbox.
5. The Autovent plug is brass in color and will be located at the highest point on the gearbox. It operates like a check-valve to allow the reducer to relieve internal pressure while preventing lubricant contamination during cooling. A spring presses a ball or plunger against a machined orifice until pressure exceeds 2 psi. Above 2 psi the air is allowed to escape depressurizing the gearbox. When internal pressure drops below 2 psi, the Autovent re-seals thus closing the gearbox to the outside environment. After shutdown, the reducer cools along with the air inside the gearbox. The unit will temporarily maintain a slight vacuum until normalization occurs.
6. Check that the vent passage through the plug is open.
7. If plugged, soak in a solvent over night.
8. Use a high-pressure air hose to blow the passage open. Use a probe to clear the passage if the hole is caked with dirt.
9. Install and tighten the breather plug.

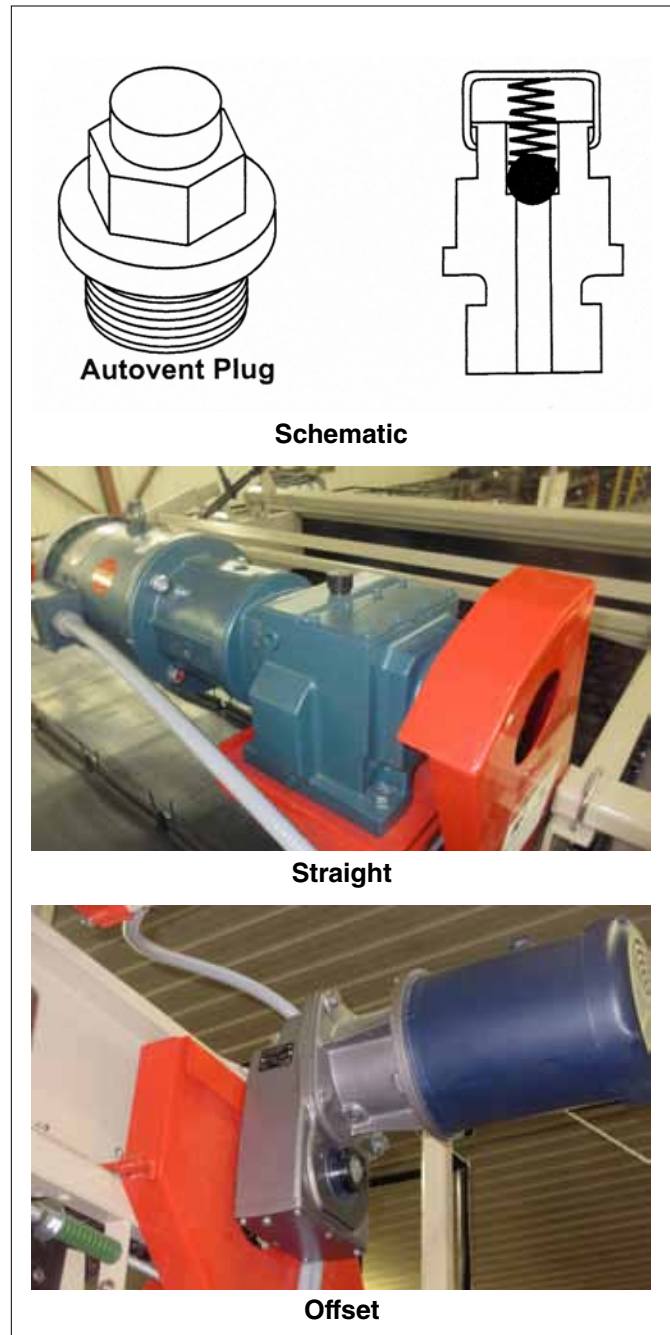


FIG. 44 AUTOVENT BREATHER (TYPICAL)

IMPORTANT

Always clean the breather if any leaks are noticed around shafts.

5.2.3 CONVEYOR BELT TENSION/ALIGNMENT OR REPLACEMENT

Conveyor belts are used to move potatoes with the machine. The tension and alignment of the conveyors should be checked daily to insure proper function. Replace the conveyor when damaged or badly worn. To maintain conveyor belt(s), follow this procedure:

1. Place all controls in their OFF or neutral position.
2. Turn the power OFF at the master panel and lock-out tag-out.
3. Clear the area of bystanders, especially small children.
4. **Tension:**
The belts are tensioned correctly when there is a 1 to 2 inch (25 - 50 mm) sag on the bottom or slack side of the conveyor during operation and the belts should not slip during operation.

NOTE

If a belt slips during operation, locate the "take-up" end of the belt; then on both sides of the "take-up" end, loosen the hardware securing the adjusters and bearings. Tighten the belt equally on each side; then tighten all hardware to specified torque.



Adjuster (Typical)



Elevating Conveyor

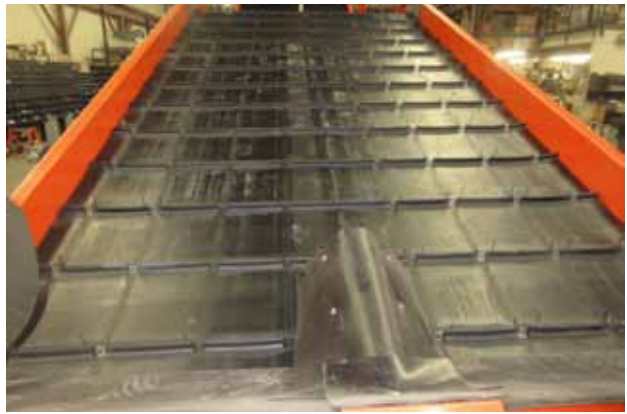


Flat Conveyor

FIG. 45 TENSION ADJUSTING (TYPICAL)

5. **Alignment:**

Conveyors are properly aligned when the belt runs in the center of the frame panels and the shafts. Be sure to run the conveyor a full revolution to check the entire belt. The belt can move from side-to-side while it is turning as long as it doesn't contact the sides. If it contacts the sides, it must be aligned. Align by loosening the shaft bearing assembly on the tight side or tightening the bearing assembly on the loose side. Move the bearing assemblies on either the drive or driven shafts to align the conveyor but always maintain the proper tension.



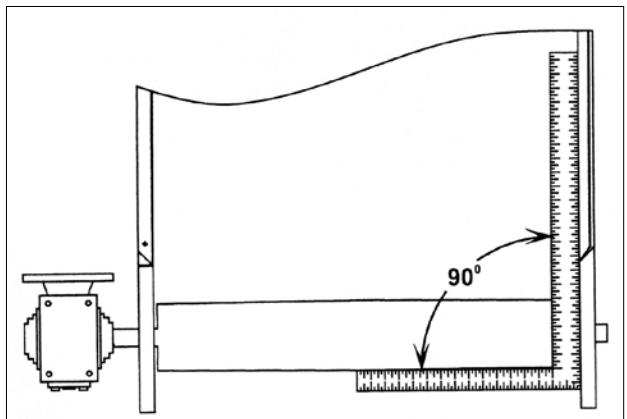
Elevating Conveyor



Flat Conveyor (Typical)



Adjustor (Typical)



Square

FIG. 46 CONVEYOR BELT ALIGNMENT (TYPICAL)

6. Replacement:

- a. Move one or both of the shafts into their loosest position.
- b. Open the belt by removing the connecting rod on the belt.
- c. Attach the replacement belt to the end of the old belt.
- d. Slowly pull the old belt out of the machine and thread the new one into position.
- e. Disconnect the old belt and connect the ends of the new one together.
- f. Move the shaft into position to set the tension of the belt and secure the bearing assemblies.
- g. Check the tension and alignment of the belt frequently during the first 10 hours of operation and set as required. Then, go to the regular maintenance schedule. Normally a belt will seat itself during the first 10 hours of operation and then require less adjustment.



Elevating Conveyor



Trash Conveyor

FIG. 47 BELT CONNECTOR (TYPICAL)

7. **Belted Potato Chain:**

The primary chains are a belted potato chain which normally will need very little maintenance and/or adjustment. If a chain runs to one side, it normally has slipped one cog on the drive sprocket. The chain will have to be loosened and properly aligned on the sprockets. Each chain is properly tensioned when it sags slightly on the bottom side but does not drag or catch on the frame.

To replace conveyor:

- a. Move one or both of the shafts into their loosest position.
- b. Open belt by removing pin at each belt.
- c. Attach the replacement belt to the end of the old belt.
- d. Slowly pull the old belt out of the machine and thread the new one into position.
- e. Disconnect the old belt and connect the ends of the new one together.
- f. Move the shaft(s) into position to set the tension of the belt and secure the bearing assemblies.
- g. Check the tension and alignment of the belt frequently during the first 10 hours of operation and set as required. Then, go to the regular maintenance schedule. Normally a belt will seat itself during the first 10 hours of operation and then require less adjustment.

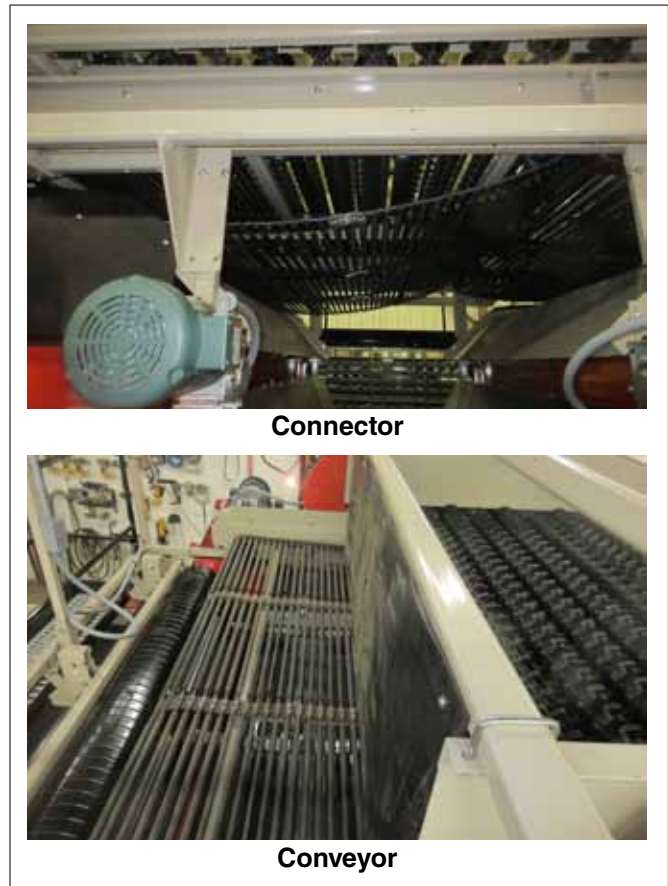


FIG. 48 BELTED POTATO CHAIN CONVEYOR (TYPICAL)

5.2.4 ROLLER CHAIN DRIVES

Roller chains are used at several locations to convey rotational power to rollers and shafts. Stationary or spring-loaded idlers are used to maintain the chain at its required tension and sprocket alignment.

Lock-out tag-out power supply before performing any service or maintenance work on the Clod Hopper. Also, clear the area of bystanders, especially small children before starting.

Follow this procedure when checking and adjusting chain tension and sprocket alignment:

5.2.4.1 SPRING-LOADED IDLER:

1. Open or remove guard.
2. Loosen jam nut on the adjustment bolt.
3. Push in the adjustment bolt to check for proper compression. Approximately 10 ft-lbs (1.4 kg-m) of force should be required to compress the spring and put adequate tension on the chain.
4. Rotate the adjustment bolt to adjust spring compression.
5. Tighten jam nut.
6. Install and secure guard.



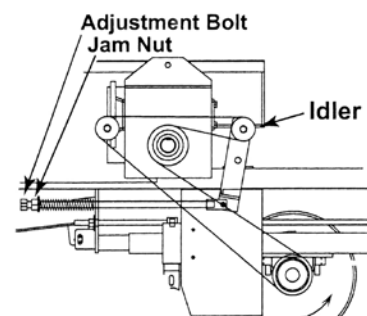
Ellis Table



Sizing Table



Rear Top Roller



Typical Spring-Loaded Idler

Schematic

FIG. 49 SPRING-LOADED IDLER SYSTEM (TYPICAL)

5.2.4.2 STATIONARY IDLER:

1. Open or remove guard.
2. Loosen bolt and nut securing the stationary idler.
3. Push the stationary idler toward the chain until all slack is removed from the chain.
4. Tighten the bolt and nut to secure the stationary idler.
5. Install and secure guard.

IMPORTANT

If idler has run out of adjustment, shorten or replace chain.



Secondary Elevator



Collector Conveyor

FIG. 50 STATIONARY IDLER (TYPICAL)

5.2.4.3 ALIGNMENT:

All chain drive systems must be kept in alignment to insure proper performance and durability. Observe the condition of the sides of the roller chain. Adjust the sprocket alignment if one side of the roller chain has more wear than the other.

Sight along the sprockets to see which one is not aligned. Loosen and move sprocket. Secure sprocket.



Collector Conveyor



Ellis Table



Rear Rolls

FIG. 51 SPROCKET ALIGNMENT (TYPICAL)

5.2.5 BLOWER DRIVE BELT TENSION & ALIGNMENT

A set of V belts transmits rotational power to the optional blower behind the Ellis Table. They must be kept properly tensioned and the pulleys aligned to obtain the expected performance and life.

To check the tension and alignment, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Lock-Out Tag-Out power supply before starting.
3. The belt should not slip during operation.
4. If the belts slip during operation, adjust the belt tension by following this procedure:
 - a. Set the tension on the drive belts by moving the blower frame.
 - b. Loosen blower position jam nut and move frame.
 - c. Tighten blower frame position bolt and jam nut.
 - d. Use the motor mounting bolts to move the motor for setting the belt tension if the blower frame angle can't be changed.
 - e. Tighten motor mount anchor bolts to their specified torque.
5. Lay a straight edge across the pulley faces to check alignment. Adjust pulley alignment if pulley faces vary by more than 1/32 inch (0.7 mm).



FIG. 52 BLOWER DRIVE BELT (TYPICAL)



FIG. 53 PULLEY ALIGNMENT

6 TROUBLESHOOTING

The Harriston Clod Hopper is a large machine that removes stones, clod and trash from a stream of potatoes. It is a simple and reliable system that requires minimum 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, even after having read through this trouble shooting section, please contact your local Harriston dealer or the factory. Before you call, please have this Operator's Manual and the serial number from your machine ready.

PROBLEM	CAUSE	SOLUTION
Clod Hopper will not turn on.	E-Stop switches in OFF position.	Reset switches to ON position.
	Master switch OFF.	Turn switch to ON.
	Circuit breaker tripped.	Reset breaker.
	No power to control panel.	Have electrician check electrical service.
	Master switch defective.	Replace master switch.
	Start switch defective.	Replace start switch.
One motor doesn't run.	Panel relay tripped/defective.	Reset/replace relay.
	Motor wiring damaged/defective.	Repair/replace motor wiring.
	Motor defective.	Replace motor.
Trash in produce conveyor/produce in trash conveyor.	Feeding too much.	Slow down material entering input conveyor.
	Uneven feeding.	Evenly distribute material across input conveyor.
	Dirty rollers.	Clean rollers.
	Divider(s) positioned incorrectly.	Position divider(s) at separating line.
	Roller(s) positioned incorrectly.	Adjust rollers to 10 - 10:30 position.
Conveyor belt will not turn.	Conveyor overloaded.	Reduce load on conveyor.
	Conveyor belt too loose.	Tighten conveyor belt.
	Bearing damaged/defective.	Replace bearing.
Conveyor belt not tracking correctly.	Conveyor roller(s) not square.	Align rollers.
	Trash build-up on roller.	Clean roller.
	Bearing damaged/defective.	Replace bearing.
Gearbox running hot.	Low on oil.	Add oil.
		Replace gearbox.

7 SPECIFICATIONS

7.1 MECHANICAL

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

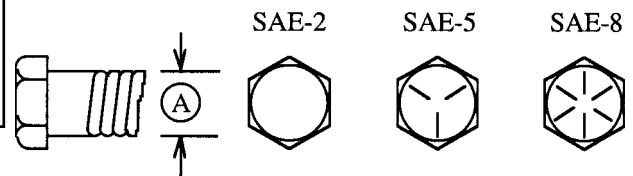
7.2 BOLT TORQUE

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.

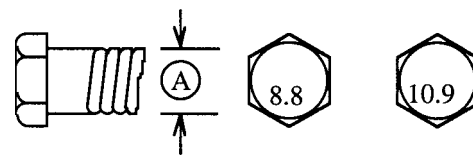
ENGLISH TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*					
	SAE 2 (N.m) (lb-ft)		SAE 5 (N.m) (lb-ft)		SAE 8 (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	60	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"	345	225	850	630	1320	970



METRIC TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*			
	8.8 (N.m) (lb-ft)		10.9 (N.m) (lb-ft)	
M3	.5	.4	1.8	1.3
M4	3	2.2	4.5	3.3
M5	6	4	9	7
M6	10	7	15	11
M8	25	18	35	26
M10	50	37	70	52
M12	90	66	125	92
M14	140	103	200	148
M16	225	166	310	229
M20	435	321	610	450
M24	750	553	1050	774
M30	1495	1103	575	1550
M36	2600	1917	3675	2710



Torque figures indicated above are valid for non-greased or non-oiled threads and heads 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 value for bolts and capscrews are identified by their head markings.

73 ELECTRICAL SCHEMATIC

Line phasing, line voltage, control voltage, and accessory options can vary substantially for each machine.

Please contact factory at 1-800-437-8205 for your machine's specific electrical layout.

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