



BROUWER
RoboMax
SOD HARVESTER
Model: 4132506. New Holland
OPERATOR'S MANUAL



Brouwer Turf
23324 Woodbine Avenue, Keswick Ontario Canada L4P 3E9
Tel (905) 476-6222 Fax (905) 476-6744 Web Site www.brouwerturf.com
info@kesmac.com

KM99173
November 2010
Revision D



Turf Harvester

Operator's Manual

Contents

Foreword

Section 1.

Safety

Section 2.

Controls

Section 3.

Operation

Section 4.

Maintenance/Lubrication

Section 5.

Adjustments

Section 6.

Auto-Steer

Turf Harvester

Safety Precautions

IMPORTANT

The Owner and Operator, must assume responsibility for the safe operation of the machine, their own safety, and the safety of others, by reading, understanding, and following, all of the safety instructions and operating procedures as outlined in the machines Operator's Manual.

Failure of the Owner or Operator to adhere to the recommended safety instructions and operating procedures, indemnifies Brouwer Turf Equipment Inc. against any claims that may arise, due to accidents resulting in personal injury or property damage.

It is not possible to list all situations that may affect the safety of the machine or the operator, and therefore Brouwer cannot list all precautions, and identify all potential hazards, that may prevent accidents.

IF YOU DO NOT UNDERSTAND....ASK

BE A QUALIFIED OPERATOR BY ;

- Reading and obeying the instructions in this manual, the tractor manufacturers operator's manual, and the safety decals on the machine.
- Receiving operational training on the sod harvester.
- Asking your supervisor or equipment dealer to explain anything you do not understand.
- Explaining the written instructions in the operator's manual and safety decals to user/operators who cannot read or understand them.



WARNING

The Brouwer **Robomax Turf Harvesters** are designed for safe efficient operation and must not be used for any purpose other than that for which they are designed.

Prior to being shipped from the manufacturer the machines are inspected to insure that all safety guards, shields and warning/safety/operating decals are correctly positioned and secure

Before operating the machine the operator must check that all of the above items are correctly located.

The machine must not be used if any guards, shields or warning/operating decals are damaged or missing..

Your new Robomax Turf Harvester has been designed and built to give many years of outstanding performance. The service and reliability you receive from this product will be affected by the proper maintenance and operation of the machine.

Use only genuine Brouwer replacement parts. Parts not supplied by Brouwer may not meet Brouwer specifications or standards of manufacture and may void warranty. The use of non-approved parts may result in component failure and possibly cause in an accident to the operator or others.

IMPORTANT

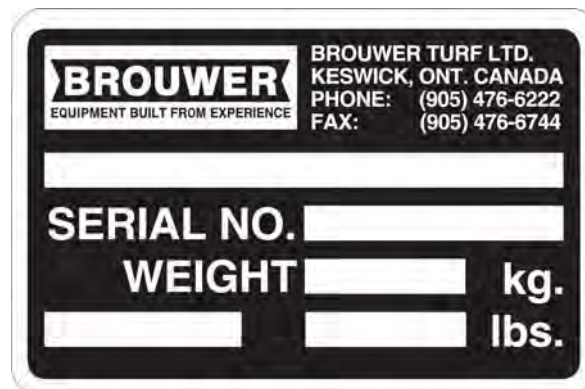
MODEL NUMBER

The Model Number appears on sales literature Technical manuals and price lists.

SERIAL NUMBER

The serial number applies only to the machine to which it is allocated.

The serial number **MUST** be quoted when ordering parts or calling for service or warranty



SECTION 1

Safety Symbols	1-1
Safe Operation	1-2
General Operating Safety	1-3/1-4
Maintenance Safety	1-4/1-6
Transport and Storage	1-7
Safe Service Procedure	1-7
Tire Service	1-7
Handling Chemicals	1-7
Safe Welding	1-8
Safety Warning Decals	1-9/1-11

**WARNING**

Unauthorized modifications may result in **extreme safety hazards** to operators and bystanders, and could result in damage to the machine.

Brouwer Turf Ltd. Warns against and strongly rejects and disclaims against any modifications, add-on accessories or product modifications that are not designed, developed, tested and approved by Brouwer Engineering Department.

Any Brouwer product that is altered or modified in anyway that is not authorized, after original manufacture, including after market accessories or component parts that are not approved by Brouwer Turf Ltd. will result in the machines warranty being voided.

All liability for personal injury and/or property damage caused by any unauthorized modifications, add-on accessories or products not approved by Brouwer Ltd. will be considered the responsibility of the individual(s) or Company designing and/or making such changes.

Brouwer Turf Ltd. will vigorously pursue full indemnification and costs, from any party responsible for unauthorized post manufacture modifications and/or accessories, should personal injury and/or property damage result from any of the above.

**DANGER****TO PREVENT POSSIBLE SERIOUS INJURY OR DEATH :**

Under no circumstances is any service or maintenance work to be performed on the machine until :

- **THE ENGINE IS SWITCHED OFF.**
- **THE IGNITION KEY IS REMOVED.**
- **THE CAB DOOR IS LOCKED.**



This Symbol means :

- **ATTENTION !**
- **BECOME ALERT !**

Your safety and that of others is involved.

Signal word definitions.

The signal words below are used to identify levels of 'hazard' seriousness. These words appear in this manual and on the safety decals that are placed on the machine.

For your safety and that of others, read and follow the information and instructions given with these signal words and/or the symbol shown above.

**DANGER:**

Indicates an imminently hazardous situation which if not avoided **WILL** result in death or serious injury.

**WARNING:**

Indicates a potentially hazardous situation which if not avoided **COULD** result in death or serious injury.

**CAUTION:**

Indicates a potentially hazardous situation which if not avoided **MAY** result in minor or moderate injury. It may also be used to alert against unsafe practices or property damage.

CAUTION:

Used without the safety alert symbol indicates a potentially hazardous situation which if not avoided **MAY** result in property damage.

Safe Operation

Operator preparation and Training.

Read the **RoboMax** Operation and Safety Manual, and also the tractor operating manual. They must be kept on the machine at all times.

- If an operator or mechanic cannot read and understand English, it is the owners responsibility to explain the material contents to them.
- If any of the information or instructions in this manual are not clear, contact your dealer or the factory representative for clarification.
- Become familiar with the safe operation of the machine, the operating controls and the safety decals. If there are any questions concerning safety, do not operate the machine until they are clarified.
All safety guards and shields must be kept in place and in good condition. All interlock switches must be correctly adjusted.
- It is the owners responsibility to ensure that all operators and service personnel are trained in the proper operation and service procedures of the machine.
- Wear appropriate work clothing, safety equipment and work boots. Do not operate the machine with loose clothing, long hair, or any jewelry, that may get tangled in moving parts.



CAUTION

Wear suitable hearing protection such as earmuffs or earplugs, to protect against hearing impairment or hearing loss.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the machine.

- Never allow children or untrained persons to operate this equipment. Local regulations may restrict the age of the operator.
- Only the operator must be on the machine, never allow riders on the machine. Riders can be injured by foreign objects or can be thrown off the machine. Also they may obstruct the ability of the operator or the operators view resulting in unsafe operation of the machine.

- The warning/safety decals must be kept clean, legible, and undamaged. Do not operate the machine if any decals are missing or damaged. Obtain new decals from the factory.
- Do not operate the machine if drugs, alcohol or medication are being used that can affect the alertness or co-ordination of the operator. Seek professional advice, before operating the machine, if there is any doubt about the side affects of any medication being taken that may put your safety and that of others at risk.
- Keep animals and bystanders clear of the machine, at a safe distance, when operating the machine.
- The owner/operator is responsible for accidents and/or injuries that may occur to themselves, bystanders, or property that may occur as a result of the operation of this machine.

Machine preparation

- Check the 'operator presence' interlock is operating. Check tractor brake operation. Repair or adjust any problem before operating the machine.
- Do not tamper with or defeat safety devices. Keep guards, shields and interlock safety devices in place and in proper working condition. They are for your protection.
- Check regularly that all fasteners, that is, nuts/ bolts, and retainer pins are secure.
- Check daily that the machine is in good working condition. Check all tires for damage or excessive wear.
- Use only accessories, attachments and replacement parts that are approved by the manufacturer.

IF YOU DO NOT UNDERSTAND....**ASK**

General Operating Safety

- Ensure all persons are clear of the machine before starting the tractor engine. Keep hands and feet clear of the cutting unit and all moving parts.
- Do not make sharp turns. Exercise care when reversing and maneuvering. Look behind the machine and downward when reversing.
- Keep all persons clear of the Robotic Arm operating area and pallet cavity, it may move suddenly and result in serious injury.
- Use counterweights or wheel weights only as recommended in this manual.
- Exercise caution when approaching or crossing roadways.
- Put the transmission in **NEUTRAL** and **apply the Parking Brake** before dismounting. Leaving the transmission in gear with the engine stopped will not prevent the tractor from moving.



CAUTION

NEVER attempt to get on or off the machine when it is moving.
Before leaving the operating position, place the transmission in NEUTRAL, set the 'park brake', lower the cutting heads and forks to the ground, stop the engine and remove the ignition key.

Starting the Tractor



WARNING

To avoid possible injury or death from a runaway machine, **DO NOT** start the engine by shorting across the battery terminals. The machine can start when in gear if the normal safety circuitry is bypassed.

- Start only in accordance with the instructions in this manual and also the tractor operators manual.
- **DO NOT** use starting-aid fluid.
- Never start the engine from the ground. Start only from the operator's seat, with the transmission in NEUTRAL and park brake 'ON'.

Transporting

- Exercise caution when loading or unloading the machine on or off a truck or trailer.
- Ensure that the machine is properly 'blocked and secured during transport.

Operating

- Do not change the engine governor setting, or over-speed the engine.



WARNING

Work in a ventilated area, never operate the engine without adequate exhaust ventilation.
Never run the engine in an enclosed area. Exhaust fumes contain carbon monoxide and can be fatal if inhaled.

- Inspect the area to be harvested and remove any objects that may be hazardous or may cause an injury.
- Operate with adequate light and avoid any holes and other hazards.

Highway Operation

- To prevent collisions with other vehicles, slow moving tractors with attachments, towed equipment or self-propelled machines, frequently check for traffic from the rear, particularly when making turns, use turn signal lights.
- Slow down and exercise caution when making turns and crossing roads and railway tracks.
- Use headlights, flashing warning lights and turn signals day and night. Follow local regulations for equipment lighting and marking. Ensure that all lighting, signals and markings are visible, clean and in good working order. Repair or replace any lights, signals or marking that is damaged or is missing.
- Couple brake pedals together for road travel.

To prevent Tipping

- Avoid holes, ditches, slopes, and obstacles that may cause instability and the machine to tip.

SAFETY



WARNING

Never drive close to the edge of a gully or steep embankment that may collapse and cave-in, causing the machine to tip.

- Shift to a LOW gear before descending a steep hill, to assist in braking and improving your control of the machine. Use engine braking to reduce speed before applying the tractor brakes.
- Never coast down a hill, run-away machines are liable to tip.
- Slow down and exercise caution when making turns and changing direction on a slope.

Stopping Operation

- Before stopping the engine: Reduce the engine speed to '**SLOW**' and let it operate at 'no load' for several minutes, to allow the engine to cool down.

To safely park the machine:

- Stop it on level ground, move all controls to the '**OFF**' position. Lower the Cutter Head and Forks to the ground. Put the transmission in **NEUTRAL**, apply the brakes and stop the engine. Before leaving the operator's seat, wait for the engine and moving/rotating parts to stop. Remove the ignition key.

To free a 'mired' machine.

- Check that all towing devices are of adequate size/strength to handle the load.
- Always attach to the Draw Bar of the towing unit. Do not use the front attachment point. Apply power smoothly to take up slack, a sudden pull could 'snap' the towing device causing it to 'whip' or 'recoil' dangerously.

Caution should be exercised when attempting to free a machine that is stuck in mud. Hazards that can occur when towing, and are to be avoided are:

- The towing tractor overturning.
- The tow chain failing and recoiling. (Use of a cable is not recommended).
- Tow-bar failing.
- The harvester becoming unstable and tipping.

The following procedures are recommended;

- If possible reverse the machine out, if it is 'mired' in mud.
- Dig mud out from behind the wheels. Place boards behind/under the wheels and reverse out '**slowly**'. **Keep bystanders clear of the rear of the machine**
- Dig mud out from in front of the wheels and drive ahead '**slowly**'.

Maintenance Safety



WARNING

Do not service or repair this machine with the attachments in the raised position, unless they are securely blocked, or the safety devices are engaged.

Failure to do so could result in serious injury or death

- To attain maximum safety and the optimum harvesting results, maintain your RoboMax Harvester according to the recommended schedules and instructions in this manual.
- When servicing or operating the machine do not wear loose clothing or jewelry that can entangle in machinery and cause personal injury.
- Never allow untrained persons to operate or service the machine.
- Allow the engine and rotating/moving parts to come to a complete stop before attempting any service or repair work.
- Disconnect the battery cables before making any repairs, and before doing any welding on the machine. Disconnect 'negative' first, then 'positive'. Reconnect in the reverse order.
- Carefully release pressure from components with 'stored' energy.
- Park the machine on smooth, firm, level ground.
- Replace worn, damaged, or faulty parts with parts supplied by the manufacturer.
- Before working on the machine, lower the Cutter Head and Forks to the ground. If the machine needs to be raised, use jack stands. If left in a raised position hydraulic supports can settle or 'leak' down.

Maintenance Safety



WARNING

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load.

Do not work under a machine that is supported solely by a jack.

- To reduce fire hazards: Keep the engine, muffler, battery compartment and fuel storage area free of grass, leaves, debris or grease build-up.
- Clean -up any fuel or oil spillage.

Handling Fuel



WARNING

- Exercise caution when refueling
Do not over-Fill. Fuels are flammable and vapors are explosive. Avoid spillage. If using fuel cans use only approved containers and a funnel. Clean-up spills immediately.
- Do not smoke or allow naked flame or cause sparks near the fuel.
Never drain or fill the fuel tank indoors.
- Never remove the Fuel Tank Cap or add fuel when the engine is running or if it is hot.
- Never handle or store fuel containers near an open flame or any device that may create sparks and ignite the fuel or vapors.
- Ensure that the Closure Caps on the Fuel Tank, and the containers, are replaced tight and secure.



WARNING

To prevent sparks from static discharge:

- Do not fill containers in a vehicle, on a truck, or a trailer bed that has a plastic liner. Fill the containers on the ground, away from the vehicle.

- Always keep the fuel dispenser nozzle in contact with the rim of the fuel tank, or container opening, until fueling is completed.
- Do not use a nozzle lock-open device.
- Always be prepared in case of fire. Keep a first-aid kit and fire extinguisher close to hand.
- Keep emergency numbers for fire, hospital, ambulance services, and doctors close to your telephone.

Hydraulic System



WARNING

The RoboMax Hydraulic System operates under high pressure.

To prevent serious injury from hot, high pressure oil:

- Never check for leaks with bare hands.
Use cardboard, paper or wood.
- High pressure oil can penetrate the skin. If it is injected into the skin it must be surgically removed within a few hours, by a doctor familiar with this type of injury. Failure to do so may result in gangrene.

- Relieve high pressure before disconnecting hydraulic lines or fittings.
- Fully tighten fittings and connections before pressurizing the system.
- Lower Cutter Head and Forks to the ground, disengage all drives, apply the park brake, stop the engine and remove the ignition key, before inspecting or disconnecting hydraulic lines or fittings.
- Visually check daily all hydraulic hoses, tubes and fittings for leaks. Replace any worn or damaged hoses, tubes or fittings before operating the machine.
- Replacement hoses or tubes must be routed in the same location and path. Do not move clamps, brackets or ties to new locations.
- Thoroughly inspect all hoses, tubes and fittings every 300 hours.

IMPORTANT

To prevent serious damage to the hydraulic system components, do not allow any contaminants to enter the hydraulic system. Clean thoroughly around all fittings and areas to be worked on. Cap and plug any connections that are disconnected.

- Before disconnecting, tag or mark the location of the connection.
- Check that 'O-Rings' are clean and hose fittings are properly seated before tightening.
- Align the hoses without twisting. Twisted hoses can cause couplings to loosen as the hose flexes during operation, resulting in oil leaks.
- Kinked or twisted hoses can restrict the oil flow causing the system to malfunction, the oil to overheat and possible hose failure.

SAFETY

Cooling System



WARNING

To prevent serious injury from hot coolant and steam, **DO NOT** remove the radiator cap when the engine is running and/or hot. Allow the engine and system to cool, and use caution when removing the radiator cap.

- Do not operate the engine without the recommended coolant mixture.
- Add top-up coolant into the recovery tank **NOT** directly to the radiator
- Ensure that the radiator cap is tight and secure.
- If the radiator cap must be removed, stop the engine and allow the cooling system to cool, until the cap is cool to the touch. Loosen it slowly to relieve pressure, before removing completely.

Battery Service



WARNING

The sulfuric acid in the battery electrolyte is poisonous. It can cause serious skin burns and blindness if splashed in the eyes.



CAUTION

Always wear protective glasses/goggles, and protective clothing and use insulated tools when working with batteries. Read, understand, and obey all battery manufacturers instructions and warnings. Battery posts, terminals and relate accessories contain lead, lead compounds and chemicals, wash your hands after handling them.

Avoid Hazards By:

- Fill/top-up batteries in a well ventilated area.
- Wearing eye protection and rubber gloves.
- Avoid breathing fumes.
- Avoid spilling, splashing or dripping electrolyte.
- Follow proper 'jump-start' procedure.

If acid is splashed on your person:

- Flush the affected skin with water.
- Apply baking soda, or lime, to help neutralize the acid.
- Flush your eyes with water for 15 to 30 minutes. Get medical help immediately.

If acid is swallowed:

- Do not induce vomiting
- Drink large quantities of water or milk, but do not exceed 2 liters (2 Quarts).
- Get medical help immediately.

Battery Charging

- Charge batteries in an open well ventilated area, away from sparks or open flame.
- Unplug the charger before connecting or disconnecting the battery.

Jump Starting

- Check that the Jumper cables are in good condition.
- Turn the ignition and all electrical accessories 'OFF', on both machines.
- Position the machine with the 'charged' battery close to, but not touching, the machine with the dead battery, to ensure that the cables will easily reach.

Connecting the Cables

- Do not allow the cable clamps to touch any metal parts except those intended.
- Never connect the **positive '+'** (red) terminal to the **negative '-'** (black) terminal.
- Ensure that the cables cannot get caught in moving engine parts when starting.
- Connect one end of the **positive '+'** (red) cable to the **positive '+'** terminal on one battery. Connect the other end to the **positive '+'** terminal on the other battery
- Connect one end of the negative **'-'** (black) cable to the negative **'-'** terminal on the 'charged' battery. Connect the other end of the cable **to the engine block** on the machine with the 'dead' battery.
- Start the machine that has the 'charged' battery, then start the machine that has the 'dead' battery.
- Remove the jumper cables in the exact reverse order of connecting. Do not allow the cable clamps to touch any metal parts while the other end is connected to a battery terminal.

IMPORTANT

Keep the battery terminals clean. Smear them with white grease to prevent corrosion. The positive terminal (red) protective cover must be kept in place.

Transporting and Storage

- If the machine should become disabled, and cannot be moved under its own power, it should not be towed, as it would be extremely difficult to steer and stop it.
- It is recommended that it be transported on a flat-bed carrier or a truck/trailer. Use chains to secure the machine on the carrier.

Storage

IMPORTANT

If the Harvester is to be stored 'inside' keep the doors open to ensure good ventilation until the procedure below is complete.

- Stop the engine and allow it to fully cool down.
- Drain the fuel tank into an approved container and shut off the fuel. Store the fuel in a cool dry location.
- Disconnect the battery cables.
- Keep the Harvester and fuel containers in a locked, secure storage place, to prevent tampering, and children from playing in the area.
- Do not store the Harvester or fuel containers close to heating appliances with an open flame, such as a water heater with a pilot light.

Safe Service Procedures

- Do not service the harvester when it is moving or the engine is running.
- When servicing a four wheel drive machine, when necessary raise **front and rear wheels** off the ground. This is to prevent the machine being pulled off the jack stands if power is applied to the wheels.
- Tighten the wheel lug nuts to the correct torque as specified in the maintenance section.
- Refit all safety guards and shields that may have been removed during service.

Tire Service



WARNING

Do not operate the harvester if any of the tires are badly worn or damaged.

The **left rear wheel/tire** assembly is loaded with a Calcium Chloride solution and is **extremely heavy (934 lb)**. **Exercise caution when removing or replacing it.** Use suitable tools and equipment and hoist equipment with adequate lift capacity. It is recommended that only experienced and qualified personnel dismantle wheel assemblies.



CAUTION

Operating the machine with loose wheel lug nuts will result in damage to, and require the replacement of, wheel assembly components.

- Always maintain the correct tire pressures. Do **not** inflate tires above the recommended operating pressure shown on the side wall.



WARNING

Never weld or heat a wheel/tire assembly. The heat can cause increased air pressure and result in the tire exploding. Explosive separation of tire and rim components can result in serious injury or death

- When inflating tires use a clip-on chuck, and an air hose that is long enough to allow you to stand to one side of the wheel, not in front or over it. Use a safety cage if one is available.

Handling Chemical Products



CAUTION

To prevent serious personal injury avoid direct exposure to hazardous chemicals. Potential hazardous chemicals include : fuels, lubricants, coolants, paints and adhesives.

Material Safety Data Sheets (MSDS)

Material Safety Data Sheets provide specific details on chemical products that affect:

- Physical and personal health hazards.
- Safety procedures.
- Emergency response techniques.

It is recommended that the MSDS data is checked before a job is started that involves a hazardous chemical. This informs of the possible risks and the safest way to proceed. Follow carefully the recommendations.

Proper Waste Disposal

- Improper disposal of waste material is harmful to the environment. Some potentially harmful products used on machines are: oil, fuel, filters, coolant, brake fluid, and batteries.
- Use leak proof containers when draining fluids. Do not use food or beverage containers that someone may mistakenly drink from.
- Do not pour waste fluids onto the ground, down a drain or into any natural water source.
- Air conditioning refrigerants are harmful to the atmosphere. Government regulations may require a certified technician to service and properly recover and recycle refrigerants.

SAFETY

- Before disposing of waste material, enquire at your local environmental or recycling facility for instructions on proper waste disposal.

Welding on Painted Areas



CAUTION

Hazardous fumes are generated when paint is heated when welding, soldering, or using a torch. The use of an approved respirator is recommended when welding, sanding or grinding on painted areas, to avoid the inhalation of fumes or dust.

- It is recommended that paint be removed a minimum of 4 inches (100mm) from around the area to be affected by heating.
- If solvent or stripper is used, wash them off with soapy water before doing any welding. Remove any stripper or solvent containers and other flammable material from the area. Allow a minimum of 15 minutes for fumes to disperse before welding.
- Do not use chlorinated solvent in areas where welding will be done. Do all work in an area that is well ventilated to allow fumes and/or dust to disperse.



CAUTION

Do not weld, solder or use a torch close to pressurized fluid lines, that may cause them to burst. Flammable spray can be generated by burst fluid lines resulting in severe burn injury to yourself and bystanders.

CAUTION

To protect both of the Electronic Controllers from potential damage :

Do not do any welding on the machine until :

- Both battery cables are disconnected.
- The Plus 1 Micro-controllers are disconnected.

D001-183



CAUTION

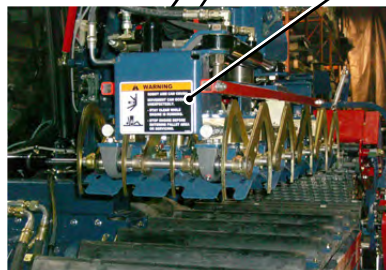
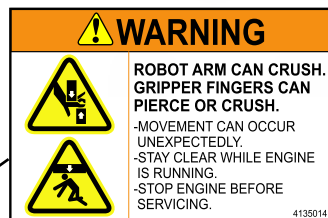
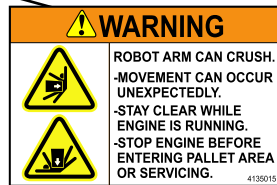
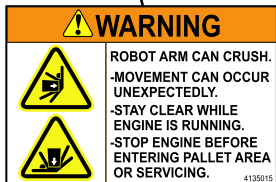
Exercise extreme caution when removing/installing controller connections and verify proper locations.



00-226



00-226



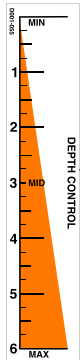
(Typical in 2 places. One at each end of the Gripper Head.)



4135181



4135014



D001-055

WARNING
KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH
SHIELD REMOVED. 00-370



CAUTION

System under pressure.
Do not open cap
when hydraulic
system is hot. 006204

006204

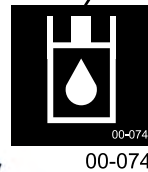


2000653

WARNING

HOLD ACTUATOR LEVER
WHEN DISCONNECTING.
RELEASE THE ACTUATOR
SPRING TENSION SLOWLY. 015777

015777



00-074



009097

CAUTION
Do not step on conveyor
at any time 0001-116

D001-116



WARNING
CRUSHING HAZARD
Stay clear of moving parts 0001-054

D001-054



00-226

WARNING

KEEP CLEAR
OF CONVEYOR. 015900

015900

CAUTION
STOP ENGINE BEFORE
ATTEMPTING INSPECTION,
CLEANING, OR ADJUSTMENT. 00-283

00-283

CAUTION
Do not step on conveyor
at any time 0001-116

D001-116

WARNING
KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH
SHIELD REMOVED. 00-370

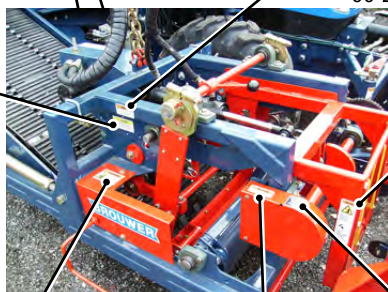
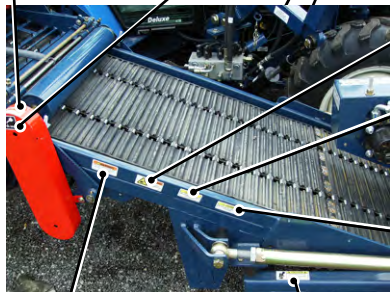
00-280



RELEASE CAM STOP
BEFORE
SERVICING.

NOTE
STRIKE CAM STOP FROM
BELOW TO
RELEASE.
KEEP CLEAR. 009432

009432



WARNING
KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH
SHIELD REMOVED. 00-370

00-370



00-282

CAUTION
KEEP AWAY FROM
CLOSE CLEARANCE
AREAS. 00-282

WARNING

CRUSHING HAZARD
To prevent serious
injury, stay clear of
moving parts. 0001-032

D001-032

WARNING
KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH
SHIELD REMOVED. 00-370

00-370



00-226

CAUTION
DEPRESS CLUTCH BEFORE
ENGAGING DIFFERENTIAL
LOCK OR SERIOUS DAMAGE
MAY RESULT.

00-262



2000653

CAUTION
Do not step on conveyor
at any time

D001-116

IMPORTANT
The Cylinder Lock is to be used
ONLY DURING SERVICING.
Do not use when transporting, as shock
loads could damage the Harvester.

D001-136



WARNING
To Prevent Serious Injury or Death
• Avoid unsafe operation or
maintenance
• Do not operate or work on this
machine without reading and
understanding the operator's
manual.
• If manual is lost, contact your
nearest dealer for a new manual.

D001-033

CAUTION
1. Read Operator's Manual before operating
this harvester.
2. Keep all shields in place.
3. Do not tow with this machine.
4. Do not transport with a tow bar.
5. Make certain everyone is clear of machine
before starting engine or operation.
6. Keep all riders off harvester and equipment.
7. Keep hands, feet and clothing away from
power take-off parts.
8. Reduce speed when turning or applying
braking forces or operating around
obstacles, wet rough ground or steep
slopes.
9. Use flashing warning lights on highway
when prohibited by law.
10. Stop engine, lower implement to ground
and set parking brake when leaving
working area.
11. Wait for all movement to stop before
servicing machinery.
12. Remove key if leaving harvester
unattended.

4133093

WARNING
To prevent serious injury or death the operator must read the safety warnings and instructions in the Machine and the Tractor Operator's manuals. The manuals must be kept on the machine at all times.
• The operator MUST NOT leave the operator's seat while the engine is running and attempt to make any adjustments, fix a jammed mechanism or clear debris, particularly at the rear of the machine in the vicinity of the Gripper Head, Robotic Arm and the Pallet Injection area.
• Bystanders must be kept clear of the machine when in operation.
When leaving the machine unattended, place in 'PARK', stop all functions, lower the Conveyor, Pallet Forks, and Gripper Head. Stop the engine, remove the ignition key and lock the cab door.

D001-222

CAUTION
AVOID INJURIES.
ENGAGE AUTO-
STEER ONLY
WHEN HARVESTING.

015499

CAUTION
To protect both of the Automotive Controller from
potential damage:
Do not do any welding on the machine until:
• Both battery cables are disconnected.
• The Automotive Controller is
disconnected.

D001-184



WARNING
PALLET DISPENSER
CAN CRUSH.
-MOVEMENT CAN OCCUR
UNEXPECTEDLY.
-STAY CLEAR WHILE ENGINE
IS RUNNING.
-STOP ENGINE BEFORE
ENTERING PALLET AREA
OR SERVICING.

4136687



WARNING
NO RIDERS
Vehicle is to be ridden
in operators seat only.
Failure to do so could
result in death or
serious injury.

D001-024

WARNING
PALLET DISPENSER
CAN CRUSH.
-MOVEMENT CAN OCCUR
UNEXPECTEDLY.
-STAY CLEAR WHILE ENGINE
IS RUNNING.
-STOP ENGINE BEFORE
ENTERING PALLET AREA
OR SERVICING.

4136687



WARNING
• Ensure that all bystanders are clear of the Robotic Arm and the
Indexing Conveyor when operating the manual operation levers.
• Do not operate the manual controls when the machine is in
Auto-Mode.

INDEXING CONVEYOR		ROBOTIC ARM CONTROL LEVER	
UP	DOWN	UP	DOWN
LEVER 'UP'	LEVER 'DOWN'	LEVER 'UP'	LEVER 'DOWN'

D001-194

WARNING
MACHINE CAN CRUSH
-MOVEMENT CAN OCCUR
UNEXPECTEDLY.
-STAY CLEAR WHILE ENGINE
IS RUNNING.
-STOP ENGINE TO CLEAN OR
SERVICE.

4137371

SECTION 2

Cab Controls	2-1
E-Stop	2-1
Auto-Steer Controls	2-1
Cutter Blade	2-1
Main Conveyor	2-1
LED. Counter	2-1
Depth of Cut	2-2
Main Conveyor Lift	2-2
Manual Over-Ride Controls	2-2
Control Panel and Screen	2-3
Initial Start	2-3
Stacking Pattern Selection	2-3
Inactive Stacking	2-4
Active Stacking	2-5
Step Sequence	2-5
Active Pallet – Full	2-6
Inactive Pallet – Full	2-7
Manual Mode	2-8
Pallet Dispenser	2-9

NOTE

All Harvester operating controls, except for Depth of Cut, Conveyor Lift, and Auto-Steer Fine Adjustment, are on the Control Console at the right hand side of the operator's seat.

Harvester E-Stop Switch

The keyed E-Stop Switch 'A' in the 'OUT' position **enables** all harvester functions except: Travel, Depth of Cut, and Cutter Head position.

When the E-Stop Switch is pushed 'IN' harvester functions are **disabled**, except: Travel, Depth of Cut and Cutter Head position.

Turn the key to return to the switch to the 'ON' position.



WARNING

To prevent possible injury, in an emergency, push the E-Stop Switch 'IN' to stop all harvester functions, except travel.

Stop travel by 'de-clutching' the transmission.

Auto-Steer Operation

The Auto-Steer is engaged, or disengaged, with the Rocker Switch 'B'.

Fine Adjust Control

The Fine Adjust Control 'J', adjusts the width of the waste strip. Turn the Control Knob 'clockwise' to **reduce** the waste strip. Turn 'counterclockwise' to **increase** it.

Cutter Blade

The Cutter Blade is engaged or disengaged with the Rocker Switch 'C'.

Adjust the Cutter Blade speed with Control Knob 'H'. Rotate the control 'clockwise' to **'increase'** the blade speed. Rotate it 'counterclockwise' to **'reduce'** the blade speed.

Main Conveyor

The Main Conveyor drive is engaged or disengaged with Rocker Switch 'D'.

The Conveyor speed is controlled with Control Knob 'I'. Rotate the Control Knob 'clockwise' to **'increase'** the speed. Rotate it 'counterclockwise' to **reduce** speed.

Pallet Injector

To engage the Pallet Injector press Rocker Switch 'E' 'UP', to disengage the Pallet Injector press Rocker Switch 'E' 'DOWN'.

To 'DROP' the Upper Pallet Injector Paddles press Rocker Switch 'F' 'DOWN'. To raise the Upper Pallet Injector Paddles press Rocker Switch 'F' press 'UP'.

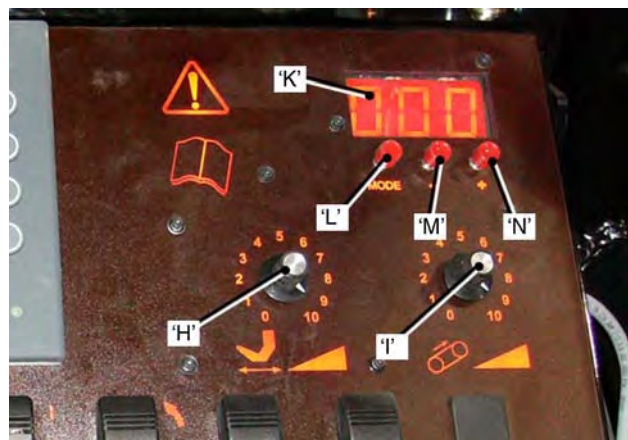
To 'DROP' the Lower Pallet Injector Paddles press Rocker Switch 'G' 'DOWN'. To raise the Lower Pallet Injector Paddles press Rocker Switch 'G' press 'UP'.

LED Counter

The LED Counter 'K' displays the Main Conveyor RPM in one mode, and the 'tooth count' for the Sod Roll Flap orientation in the other mode. The Control 'L' selects the mode.

The '+' Control 'N' and the '-' Control 'M' adjusts the tooth count. Increasing the tooth count, Control 'N', moves the Roll Flap counterclockwise, (higher).

Decreasing the tooth count, Control 'M', moves the Roll Flap clockwise, (lower), as viewed from the operator's position.



CONTROLS

Depth-of-Cut

The Depth of Cut Adjustment Lever '**P**'(green), is located to the right of the operator's seat.
'**Increase**' the depth-of-cut: move the lever '**rearward**'.
'**Decrease**' the depth-of-cut: move the lever '**forward**'.

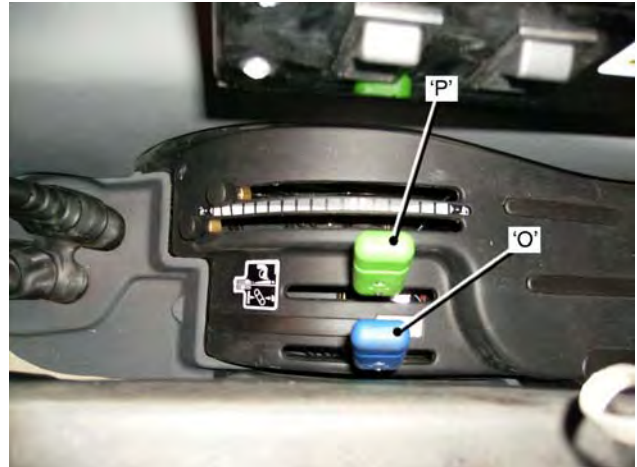
A depth of cut indicator '**Q**', on the Cutter Head acts as a guide when making adjustments to the depth-of-cut.

Main Conveyor Lift Lever

The Main Conveyor Lift Lever '**O**' (blue), is located to the right of the operator's seat.

To '**lower**' the Main Conveyor and Cutter Head, push the lever '**forward**'.

To '**raise**' the Main Conveyor and Cutter Head, pull the lever '**rearward**'.



Manual Over-Ride Controls



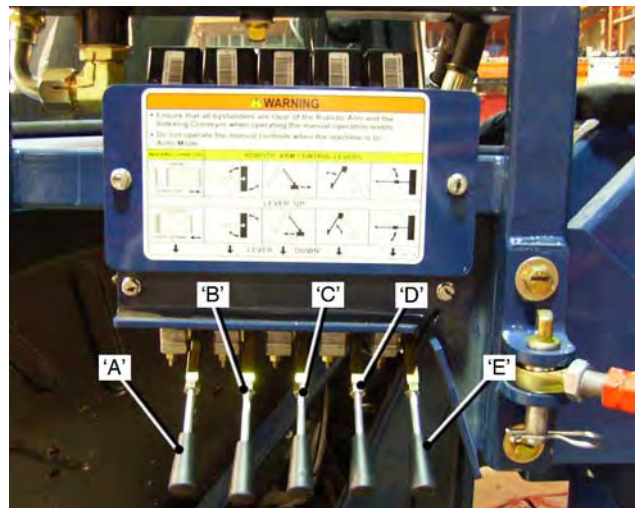
CAUTION

Do not operate the Manual Over-Ride Controls when the Harvester Switch is '**ON**'

These controls allow manual control of:
Robotic Arm, Gripper Head, and Indexing Conveyor
(bad roll ejection).

The engine must be running and the Harvester Switch in the '**OFF**' position, (Inactive Screen).

Lever '**A**' controls the **Indexing Conveyor**.
Lever '**B**' controls the **Gripper Head 'rotation'**.
Lever '**C**' controls the **Robotic Arm 'reach'**.
Lever '**D**' controls the **Robotic Arm 'lift'**.
Lever '**E**' controls the **Robotic arm 'rotation'**.



Control Panel Screens

Initial Start Screen

The Initial Start Screen is displayed when the tractor ignition key is switched to 'ON'.

- Press Pad '1', to start the Controller and bring up the Stacking Pattern Selection Screen, **after** the flashing red 'WAIT' in top left corner goes 'out'.



Stacking Pattern Selection Screen

The Stacking Pattern Selection Screen, allows the operator to select the number of rolls on each pallet.

- Press the left arrowed pad 'A' (**prev**), or the right arrowed pad 'B' (**next**), to toggle between the selections.
- Press Pad '1' (**start**), to bring up the 'Inactive Stacking Screen'.



CONTROLS

Inactive Stacking Screen

The Inactive Stacking Screen is displayed during Initial Start-up.

IMPORTANT

Do not press any control panel pads until the Active Stacking Screen is displayed.

The Inactive Stacking Screen will also be displayed when the stacking sequence is stopped.

- Press **Pad '1'**, (**start**) to display the **Active Stacking Screen**.
- Press **Pad '2'** (move manually) to display the **Move Manually Screen**.
- Press, and hold for three seconds, **Pad '3'** (reset pallet counter) to reset the **pallet counter to zero**.
- Press **Pad '4'** (**empty pallet**) to indicate a **new pallet**. An 'empty pallet' will be displayed and the pallet roll quantity is reset to zero. (The forks will not move in 'Inactive Screen').
- Press **Pad '8'** (roll adv.) to advance the **Index Conveyor** one position.
- Press the **'UP' Arrow Pad 'A'** (**add**) to **increase** the sod roll diameter in **increments of 0.10 inch**.
- Press the **'DOWN' Arrow Pad 'B'** (**sub.**) to **decrease** the sod roll diameter in increments of **0.10 inch**.
- Press the **'Right Arrow' Pad 'C'** (**calib.**) to display the **Calibration Screen**.
- Press the **'OK' Pad 'D'** (**step seq.**) to display the **Step Sequence Screen**.



Active Stacking screen

The Active Stacking Screen is displayed during the stacking sequence.

- Press **Pad '1' (stop)**, to stop the stacking sequence, and display the **Inactive Stacking Screen**.
- Press and hold, for three seconds, **Pad '3' (reset pallet counter)** to reset the **counter to zero**.
- Press **Pad '4' (roll eject)**, to activate the **'bad roll' ejection**.
- Press **Pad '8' (roll adv.)**, to advance the **Index Conveyor** one position.
- Press the **'UP' Arrow Pad 'A' (add)**, to **increase** the sod roll diameter in increments of **0.10 inch**.
- Press the **'DOWN' Arrow Pad 'B' (sub)**, to **decrease** the sod roll diameter in increments of **0.10 in**
- Press the **'OK' Pad 'C' (diag.)**, to display the **Diagnostic Screen**.



Step Sequence Screen

The **Step Sequence Screen** is displayed when the **Step Sequence Pad 'OK'**, on the Inactive Stacking Screen is Pressed.

- Press **Pad '1' (OK)**, to return to the **Inactive Stacking Screen**.
- Press the **'Left Arrow Pad' 'D' (prev.)** to **remove five sod rolls** from the pallet display.
- Press the **'Right Arrow Pad' 'E' (next)**, to **add five sod rolls** to the pallet display.
- Press the **'UP' Arrow Pad 'F' (plus)** to **add** sod rolls to the **Index Conveyor Count**.
- Press the **'DOWN' Arrow Pad 'G' (minus)** to **subtract** sod rolls from the **Index Conveyor Count**.



CONTROLS

Active Pallet Full Screen

The '**Active Pallet Full**' Screen is automatically displayed when the pallet is full.

- Press **Pad '1' (Stop)**, to display the **Inactive Pallet Screen**.
- Press **Pad '2' (Empty Pallet)**, to indicate a new pallet. An empty pallet will be displayed and pallet roll quantity is reset to zero. The pallet lift raises the new pallet to the upper position.
- Press, and hold for three seconds, **Pad '3' (Reset Pallet Counter)** to reset the Pallet Counter to zero.
- Press **Pad '4' (Roll Eject)**, to activate the '**bad roll**' ejection.
- Press **Pad '8' (Roll Adv.)**, to advance the **Index Conveyor**.
- Press the '**UP**' Arrow Pad '**A**' (**Add**), to increase the sod roll diameter in **increments of 0.10 inch**.
- Press the '**DOWN**' Arrow Pad '**B**' (**Sub**), to decrease the sod roll diameter in **increments of 0.10**.
- Press the '**Left Arrow**' Pad '**D**' (**Pallet Up**), to raise the **pallet lift**.
- Press the '**Right Arrow**' Pad '**E**' (**Pallet Down**), to **lower the pallet lift**.



NOTE

'Insert Pallet' appears on the screen only when a full pallet is displayed.

CONTROLS

Inactive Pallet Full Screen

The **Inactive Pallet Full Screen** is displayed when the **Pad '1' (Stop)** is pressed on the **Active 'Pallet Full' Screen**.

- Press **Pad '1' (Start)**, to return to the **Active Pallet Full Screen**.
- Press **Pad '2' (Move Manually)**, to display the **Move Manually Screen**.
- Press **Pad '3' (Reset Pallet Counter)**, to reset the **pallet counter to zero**.
- Press **Pad '4' (Empty Pallet)**, to indicate **a new pallet**. An empty pallet will be displayed and pallet roll quantity is reset to zero. The pallet will not 'raise' until you go to 'Active Screen'.
- Press **Pad '8' (.)** to **advance the Indexing Conveyor** one position.
- Press the **'UP' Arrow Pad 'A' (Add)**, to **increase the sod roll diameter in increments of 0.10 inch**.
- Press the **'DOWN' Arrow Pad 'B' (Sub)**, to **decrease the sod roll diameter in increments of 0.10 inch**.
- Press the **'OK' Pad 'C' (Step Seq.)** to display the **Step Sequence Screen**.
- Press the **'Left Arrow' Pad 'D' (Pallet 'Up')**, to **raise the pallet lift**.
- Press the **'Right Arrow' Pad 'E' (Pallet 'Down')** to **lower the pallet lift**.
- Press **Pad '7' (Insert Pallet)**, to initiate the **Pallet Dispense Sequence**.



CONTROLS

Manual Mode Screen

When the **Move Manually Screen** is selected, the system allows the operator to Operate the Robotic Arm, and the Gripper Head, using the Control Levers located at the left rear of the machine.

The Pallet Lift Forks 'Lift' and 'Lower' functions are controlled from the Screen.

- Press **Pad '1' (OK)**, to return to the **Inactive Pallet Full Screen**, or the **Inactive Stacking Screen**.
- Press **Pad '3' ('UP')** to 'raise' the Pallet Lift Forks.
- Press **Pad '4' (DOWN)** to 'lower' the Pallet Lift Forks.



NOTE

Refer to page 2-2 for the Manual Over-Ride Control Levers Operation.

Pallet Dispenser

Screen 1.

- When the Pallet is 'full' and '**Pallet Full**' is displayed on the screen, press the '**Right Arrow 'A' (Pallet Down)**', and hold down until the pallet is completely 'down'.
- Move the Harvester forward, for two more cuts, then stop the Harvester forward travel and press Pad '1' '**STOP**'.



SCREEN 1.

Screen 2.

- Press Pad '7' (**Insert Pallet**). The pallet dispensing sequence will start. When the pallet has been dispensed onto the pallet forks, press Pad '1' (**start**). The display will return to Screen 1.
- Press Pad '2' (**empty pallet**) to raise the forks back to the stacking position.



SCREEN 2.



CAUTION

If seven rolls are on the Index Conveyor, the '**FULL PALLET**' **must first be raised to the top position**, using the Pallet 'UP' Arrow, or change the Index Conveyor number to lower than seven, **before pressing 'EMPTY PALLET'**. Failure to do so will cause the Robotic Arm to start stacking while the Forks are moving 'UP'. The hydraulic system will not respond fully in this case.

SECTION 3

Travel Speeds	3-1
Harvester Conveyor	3-2
4 Inch Feed Roller	3-2
Starter Tray	3-2
Starter Gate	3-2
Roll-Up Conveyor	3-3
Index Conveyor	3-3
Roll Flap – Stabilizer	3-3
'Bad Roll' Ejection	3-3
Robotic Arm	3-4
Gripper Head	3-4
Pallet Lift Forks	3-4
Pallet Dispenser	3-5
Pallet Specification	3-5
Pre-Operation 'Warm-Up' Procedure	3-6
Operating Instructions	3-7/3-9

TRAVEL SPEEDS

The Brouwer RoboMax Sod harvester is fitted to a New Holland TLA Series tractor, built to Brouwer specifications specifically for sod harvesting.

The RoboMax Harvester can be specified with wheels or tracks.

When fitted with wheels, harvesting can be done in Range 1, 1st or 2nd Gear.

If tracks are fitted, travel speed is reduced approximately 50 %.

When harvesting with tracks fitted, operate in Range 1, 3rd or 4th Gear or Range 2, 1st Gear.

Engine speed should be maintained at or above 1800 rpm to maintain adequate hydraulic flow for the operation of the Robotic Arm.

RANGE	GEAR	TRAVEL SPEED (Kph./mph)
1	1	1.3 (0.82)
	2	2.0 (1.23)
	3	2.8 (1.74)
	4	4.0 (2.51)
11	1	3.1 (1.95)
	2	4.5 (2.81)
	3	6.6 (4.11)
	4	9.4 (5.85)
111	1	7.4 (4.62)
	2	10.7 (6.67)
	3	15.5 (9.65)
	4	22.2 (13.80)



CAUTION

The engine must be allowed to 'idle' for 5 to 10 minutes before switching 'OFF', to allow the Turbo Unit to cool down.

Failure to do so could result in serious damage to the Turbo.



WARNING

To prevent possible serious injury: No one should step on the conveyor, or attempt to remove to remove jammed turf rolls or debris, **while the engine is running.**

CUTTER BLADE

When starting to harvest, the Cutter Blade operation should be started **before** the Main Conveyor and Cutter head are lowered to the ground to reduce 'shock loads' to the Cutter Motor.

The Main Conveyor and Cutting Head must be lowered 'slowly to the ground, not 'dropped'. The lift Chain must be 'slack' at all times while harvesting.

CUTTER BLADE – SPEED SETTING.

For best results, start cutting at the maximum speed and work back to the lowest speed which provides the best results. Lower operating speed results in less vibration.

The tractor ground speed may have to be reduced when harvesting in rough or stony ground, to avoid possible damage to the cutting components.

MAIN CONVEYOR – SPEED SETTING

The main Conveyor speed should be adjusted to provide a space of four to six inches between the sod pieces as they travel up the conveyor. This initiates the actuation of the Index Conveyor Sensor.

If the space between the sod pieces is less than four inches the sensor may not 'see' the end of the sod piece.

NOTE

It may be necessary to adjust the Main Conveyor Speed as the hydraulic system reaches operating temperature.

When setting the Main Conveyor Speed, operate the tractor in the gear selection and at the engine RPM that will be used when harvesting.

To keep the proper spacing between the sod pieces, as they travel up the conveyor, **maintain a constant travel speed.**

OPERATION

Harvester Conveyor



CAUTION

Safety Guards may have been removed for clarity.
Do not operate the Harvester with safety guards missing or damaged.
To do so could result in serious personal injury.

4 inch Feed Roller

The four inch Roller 'A' assists in feeding the sod into the Starter Tray. It should be kept free of grass and mud build-up to maintain proper operation. The Roller is mounted on the Conveyor Mid-Idler and is driven by the Main Conveyor Belt.

To adjust the Roller:

- Place a piece of sod under the Roller, with the Roller resting on the sod. Turn the Bump Stop Adjusters 'B' until there is 1/8 inch clearance between the Bump Stops and the Frame 'C'.
- For weak, or thin turf, that require less roller pressure, adjust the Bump Stops 'down', onto the frame to raise the Roller and reduce pressure on the turf.

Starter Tray

When the end of a slab of sod passes under the Starter Gate 'D' the Gate 'drops', activating a Proximity Sensor 'E' that signals the computer:

- to count the number of teeth that the operator has pre-set
- to 'stop' the Eject Conveyor, that ejects the Roll onto the Indexing Conveyor as the Conveyor moves 'back' one position.

The first Bar 'F' (behind the Starter Gate), has a row of Pins 'G' that protrude through the Bar 1/4 in.(approx.) The Pins grip the turf as it starts to 'roll-up'.

If the turf passes through, but does not 'roll-up', tap the Pins 'IN' until they protrude 1/2 to 5/8 in.

The Pins wear with use and must be adjusted or replaced as required.

In tender sod the Pins may hold the underside of the sod too long, causing a loose roll, incorrect Roll Flap position, or partially folded 'incomplete' Rolls, in this case the Pins should be 'raised'.

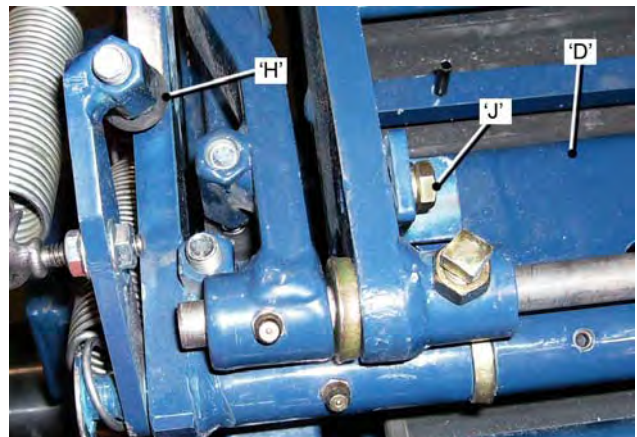
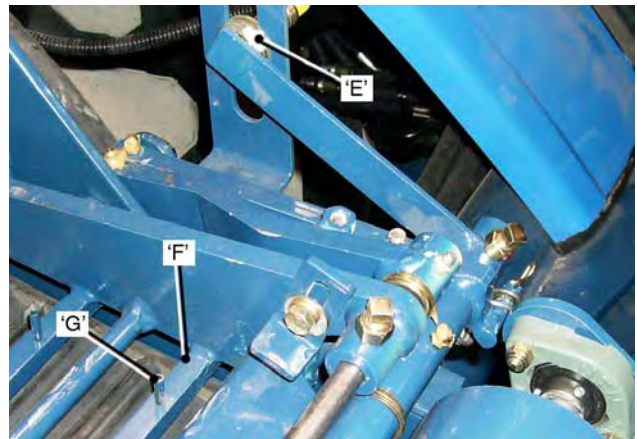
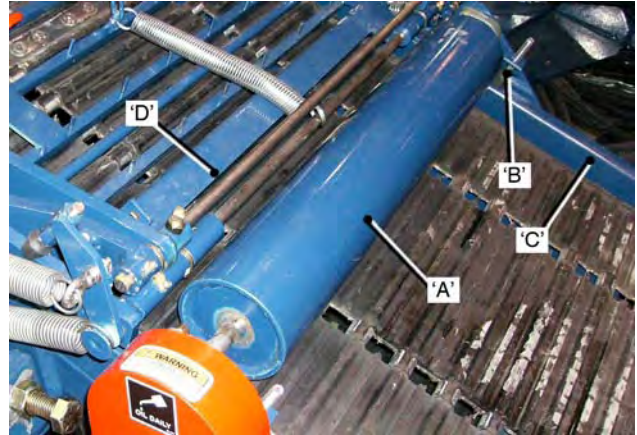
Field trial will determine the best position of the Pins for prevailing sod conditions.

- Maintain 4 to 6 inches between the sod pieces on the Conveyor.
- Do not allow dirt to build up on the Conveyor, it will cause the Starter Gate to open early.

Starter Gate

The Starter Gate 'D' must be positioned approximately 1/8 inch clear of the Conveyor Mat, measure at the join 'splice' in the Mat, ie. its thickest point. The Gate clearance is set with the adjusters 'H'.

It must not touch the mat.



The Starter Gate Stops 'J', must be adjusted so that the bottom of the Gate is level with the bottom of the Bars in the Starter Tray.

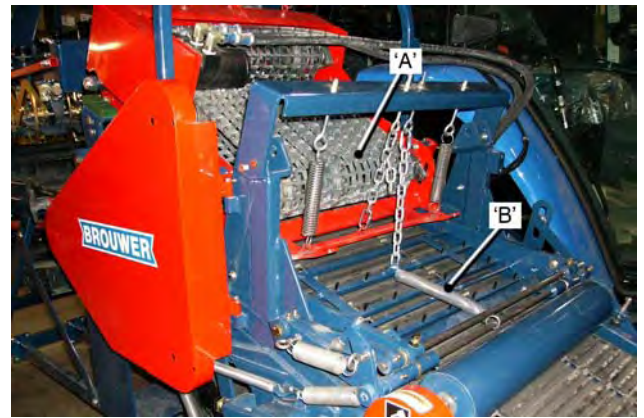
OPERATION

Roll-Up Conveyor

The Roll-Up Conveyor 'A', continues the Roll-Up action after the Roll has passed through the Starter Tray 'B'.

It is chain driven from the Main Conveyor.

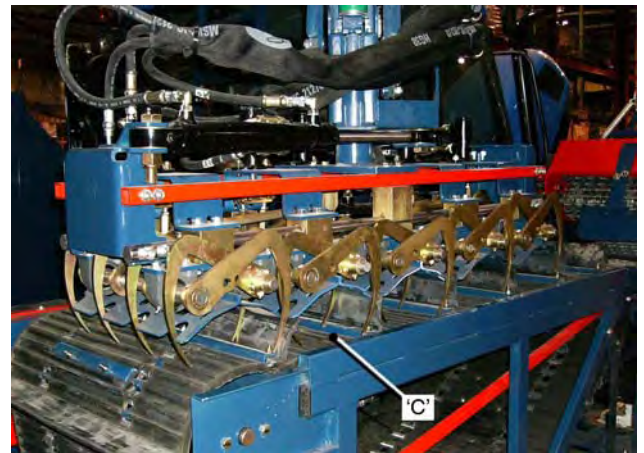
Refer to Page 5-7 for adjustments.



Index Conveyor

The Index Conveyor is operated by Hydraulic Motor. Its position is controlled by a Proximity Sensor.

The Index Conveyor 'C', is synchronized to the Main Conveyor, Robotic Arm and Bad Roll 'Ejection'. When a Roll is ready to be deposited onto the Index Conveyor, a signal from the RoboMax Controller causes the Index Conveyor to roll back 'one position', to accept the completed roll.



Roll Flap 'Stabilizer'

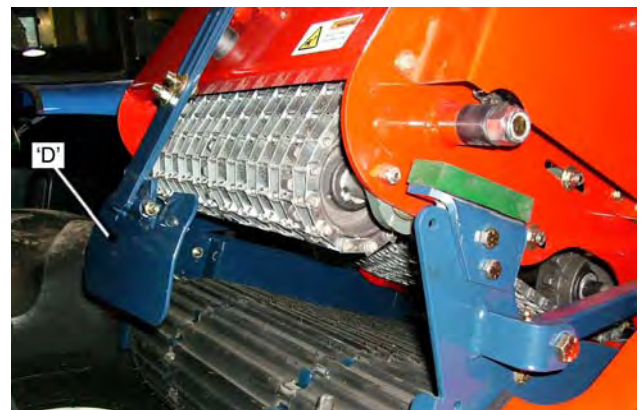
The Roll Flap 'Stabilizer' 'D', holds the sod roll as it is transferred to the Index Conveyor. The position of the Roll Flap is controlled by setting the 'tooth count', using the '+' and '-' Buttons on the Control Panel LED Display, (see page 2-1).

The 'teeth' are on a Sprocket 'E', located at the left rear of the Main Conveyor. They are 'counted' by a Proximity Sensor 'F'.

Increasing the 'tooth count' moves the Roll Flap 'counter clockwise'

Decreasing the 'tooth count' moves the Roll Flap 'clock-wise'

Adjust the Roll Stabilizer to suit the selected position of the Roll Flap.



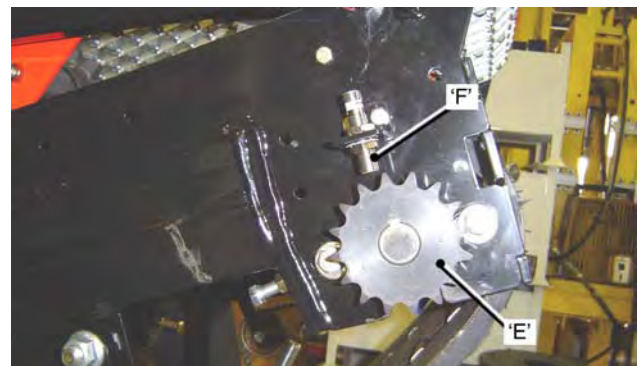
IMPORTANT

The Roll Flap Stabilizer must be set to 'just' hold the Roll. It must not 'compress' it.

Bad Roll Ejection

When a bad roll needs ejecting. The Index Conveyor Assembly is moved, and held back, allowing the Roll to drop past the Conveyor to the ground.

To activate the Roll Ejection refer to the Controls Section, page 2-5.



OPERATION

Robotic Arm and Gripper Head

The functions of the Robotic Arm 'A' are controlled by a Computer Controller, through Proportional Valves. The Proportional Valves Stack Manifold is located on the left rear fender.

The Controller provides positioning co-ordinates for:

- the Robotic Arm Lift
- the Robotic Arm Reach
- the Robotic Arm Rotation
- the Gripper Head Rotation

The Robotic Arm, in response to the Controller's pre-programmed sequence for stacking, automatically lifts the sod rolls from the Index Conveyor 'B' to the Pallet.



Gripper Head

The Controller is also programmed to control:

- the 'squeeze' function and manipulation of the Gripper Fingers 'C'.



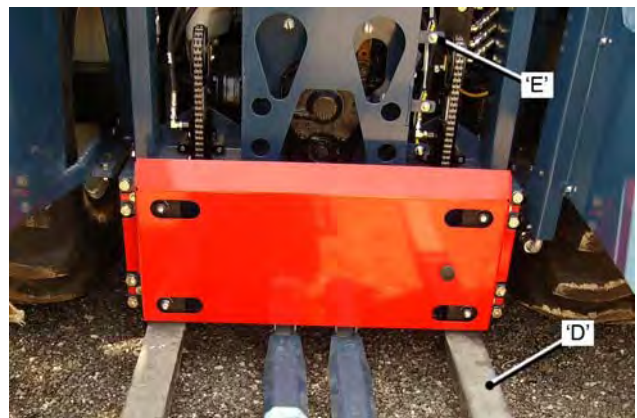
Pallet Lift Forks

The Pallet Lift Forks 'D' are lowered automatically, by the Controller, as the layers of sod are added to the pallet.

When the stacking is complete, the loaded pallet is lowered to the ground.

There are four Proximity Sensors 'E', that sense the three programmed positions of the Lift Forks.

- In the '**upper**' position two layers are placed on the pallet.
- In the '**middle**' position one layer is added.
- In the '**lower**' position the remaining layers are added.
- Pallet '**insert**'.



Pallet Dispenser



DANGER

Keep all bystanders clear, do not allow anyone to enter between the Pallet Dispenser and the Harvester. **To do so could result in serious injury or death.**

Operating Position

The Pallet Dispenser is located at the rear left side of the Harvester. It holds up to 15 pallets, ready to be transferred to the Lift Forks.

Pallet placement is controlled by 'inputs' from the operator. (see Controls Section page 2-9). Pallet 'transfer' operation is by hydraulic cylinders. The cylinders are controlled by the Controller and Proximity Sensors.

Stowed Position

The Pallet Dispenser Assembly can be 'manually' rotated from its operating position, to a 'stowed' position. This reduces the width of the machine, for convenience when shipping or transporting.



Pallet Dispenser – Operating Position



Pallet Dispenser – 'Stowed Position'.

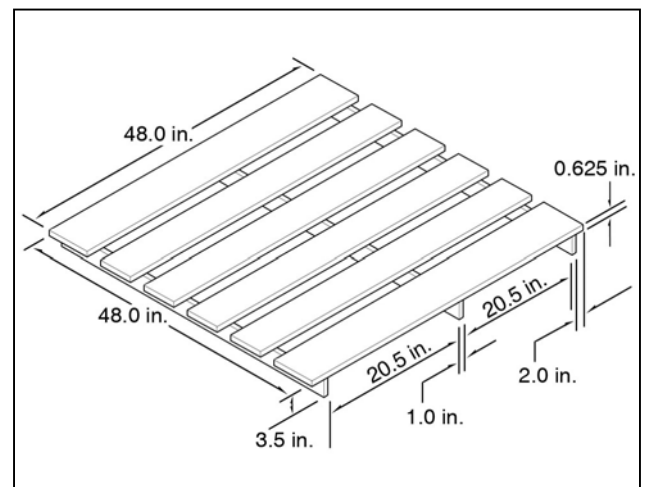
Pallet Specifications

IMPORTANT

To ensure proper operation of the Pallet Dispenser, the Pallets must conform to the dimensions shown.

The pallets must be in good condition, with no loose or broken boards.

The Pallet must be able to support 4000 lbs.



Pallet Specifications

OPERATION

PRE-OPERATION WARM-UP PROCEDURE.



DANGER

When carrying out the following procedures all bystanders **MUST BE KEPT CLEAR** of the machine. Failure to observe this precaution could result in serious injury or death.

IMPORTANT

Before operating the machine for harvesting it is important that the Hydraulic Oil is brought up to operating temperature. If the ambient temperature is **below 75 deg. F**, proceed as follows.

- Start the Tractor Engine and switch the RoboMax System Power '**ON**'.
- Allow the Hydraulic Pumps to operate and circulate oil through the system, until the normal oil operating temperature is indicated on the temperature read-out on the Control Panel Screen.
- Place the System in '**manual**' mode.



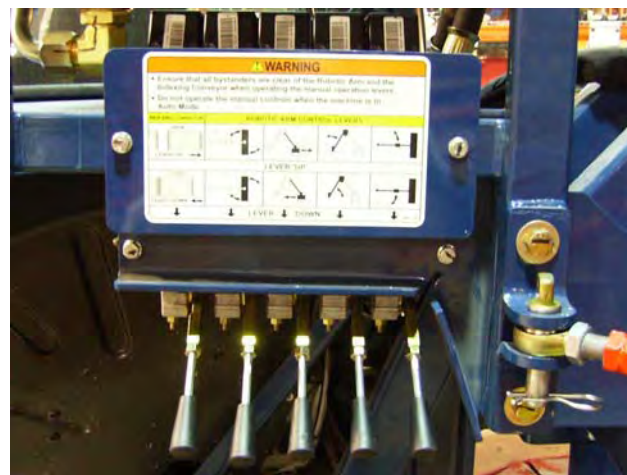
Using the Manual Control Levers, at the rear left side of the machine, operate the following through several cycles.

- Robotic Arm – Lift and Lower.
- Robotic Arm – Rotation.
- Robotic Arm – Extend.
- Gripper Head – Rotation.
- Roll 'Eject'.



CAUTION

To prevent damage to the Cut-off mechanism the Cut-off must only be operated when the machine is harvesting.



Manual Operating Controls

The above procedure will:

- Ensure that the Machine will function efficiently, with the Hydraulic Oil at the correct temperature.
- Prevent possible damage to components due to cold hydraulic oil.
- Serve to check that the machine is properly 'set-up' ready to operate.

OPERATION

Operating Instructions.

NOTE

Refer to the Controls Section for the 'Controls Functions' instructions.



CAUTION

Before starting to cut the field, ensure that all bystanders are clear of the area, and that there are no foreign objects or obstacles that may possibly cause an accident.

- From the operator's position place all controls in '**Neutral**'.
- Inject a pallet onto the Lift Forks.
- Press the clutch pedal to deactivate the 'starting' safety switch.
- Move the throttle control to the '**halfway**' position, and turn the ignition key to '**START**'. Release the key when the engine starts.

NOTE

If there is a 'pause' during the engine start presetting action, it will result in the Controller and the Control Display to go to the 'Initial Start' sequence twice. If this occurs they may get out of 'synch', and it will be necessary to restart the tractor.

- Pull the 'keyed' (**red**) Harvester Switch '**out**'. This will '**enable**' the harvester functions, except: Travel, Depth of Cut and Cutter Head Position.
- Press **Pad '1'** on the Initial Start Screen, to start the Controller. The Stacking Pattern Selection will then be displayed on the screen.
- To select the required Stacking Pattern press the '**Prev**' or '**Next**' Pads.

NOTE

There are four 'standard' patterns.

IMPORTANT

When the '**Active**' Screen is displayed you can prepare to start harvesting. If the field has not been previously cut, it will be necessary to cut a strip in the '**manual**' mode to create the edge for the Auto-Steer Guide Shoe to work against.

The initial strip **must be cut straight** to ensure that the Auto-Steer operates properly.
Refer to Auto-Steer Section.

- Lower the Cutter Head by moving the Main Conveyor Control Lever '**FORWARD**', until the Conveyor Lift Chain is 'slack'.

IMPORTANT

The Conveyor Lift Cylinder Safety Lock **must be released** before lowering the Cutter Head.

- Increase the engine speed to **1800 RPM minimum**, to ensure sufficient hydraulic oil flow.
Engine speed can be set at **1800 to 2400 RPM** when harvesting.
- Start the Cutter/Conveyor operation with the Rocker Switch on the Control Panel.
Adjust the Main Conveyor speed with the Control Knob on the Control Panel.

The speed of the Main Conveyor must be adjusted relative to the ground travel speed.

Recommended Conveyor speeds are shown below:

Wheel Equipped Units.	Conveyor Speed
Range I. 1st.Gear	65 – 75 RPM.
Range I. 2 nd .Gear.....	75 – 90 RPM.
Track Equipped Units.	
Range I. 3 rd .Gear.....	65 – 75 RPM.
Range I. 4 th Gear.....	75 – 90 RPM.
Range II. 1 st Gear.....	70 – 80 RPM.

Adjust the Conveyor speed to provide 4 to 6 inches between the sod pieces on the conveyor.

The Tooth Count for the Index Conveyor also has to be adjusted, relative to the ground travel speed, to ensure that the Roll Flap is positioned correctly.

Tooth Count recommended starting point:

Wheel Driven Machines.	
Range I. 1 st Gear	23 Teeth.
Range I. 2 nd Gear	20 Teeth.
Track Driven Machines	
Range I. 3 rd .Gear	23 Teeth.
Range I. 4 th Gear	20 Teeth.
Range II. 1 st Gear	22 Teeth.

The above settings may require adjustment, depending on prevailing ground conditions.

Cont...

OPERATION

...cont

Transmission Operating Ranges.

- Select the required transmission configuration, using the **'Range'** and **'Shift'** Levers, located to the right of the operator's seat.

Transmission Operating Ranges are:

Wheel Driven Machines.

Range I. 1st. Gear.
Range 1. 2nd. Gear.

Track Driven Machines

Range I. 3rd Gear.
Range I. 4th Gear.
Range II. 1st Gear.

- Move the Shuttle Lever (left Side), to the **'forward'** position – to select **'forward'** Gears.
- Release the **'PARK'** Brake and the Clutch Pedal. The Machine will move forward and the Cutter Head will be operating.
- Adjust the sod thickness with the Depth of Cut Lever. Move it **'forward'** to **'increase'** the sod thickness and **'rearward'** to **'decrease'** the thickness.

At this point the Rolling and Stacking process is automatic. Adjust the sod to the thickness required, while harvesting.

Defective Roll Ejection.

Defective rolls of sod can be **'ejected'** by pressing **Pad'4' (Roll Eject)** on Active Stacking Screen. It must be pressed after the Roll has been placed, and the Index Conveyor has stopped but before the next Roll enters the Roll-up Conveyor.

The Index Conveyor moves **'back'** allowing the defective roll to drop to the ground.

The Index Conveyor will remain **'back'** until the next roll is ready to be placed on it, it then move **'forward'** automatically.

NOTE

If there are areas of poor sod, or strips, that do not require stacking, the Index Conveyor can be held in the **'back'** position allowing the sod to fall to the ground. To hold the Conveyor **'back'**, press the **'4' Pad** and then the **'1' Pad (Stop)**. This will stop the stacking sequence and prevent the Controller from sensing the ends of the Rolls or Strips.

Stacking Sequence.

IMPORTANT

Do not 'stop' or 'slow' the engine while stacking

When the 40, 50, 60 or 70th Roll, depending on the pallet stack selected, is picked from the Index Conveyor, five more rolls are needed to finish the pallet. A warning lamp **'blinks'** when there are three more rolls to go. When the 5th piece of sod is cut and starts up the Main Conveyor the operator must **'stop'** the **'forward'** travel of the harvester.

The Robotic Arm picks up the rolls for the last layer after the 5th Roll is placed on the Index Conveyor.

Pallet Full and Insert new Pallet.

After 44, 54, 64 or 74 Rolls, depending on the pallet stack selected, have been stacked on the pallet, the **'Pallet Full' Screen** is displayed. Press the **'Right Arrow' Pad (Pallet Down)** to lower the completed pallet to the ground. When the pallet is on the ground, continue cutting (two more cuts), until the pallet is clear of the Lift Forks. Stop the harvester and press the **'stop' Pad**. Refer to page 2-9 for the Pallet Dispense sequence.

Stopping the Stacking Sequence.

To stop the stacking sequence:

- Press **Pad '1'**, on the **'Active' Screen**, or press the Harvester Switch on the Control Console.

It is recommended that the Stacking Sequence is stopped **after** the Robotic Arm has placed the Rolls on the Pallet and returned to the **'home'** position over the Index Conveyor. This allows the Controller to count the completed rolls.

If the stacking sequence is stopped, before the Robotic Arm has completed the stacking cycle, the Robotic Arm will not return to the **'home'** position **until the stacking sequence is restarted**.

After restarting the stacking sequence, the rolls that were being stacked may be scattered when the Arm returns to the **'home'** position, it will then be necessary to manually adjust the roll count on the display.

Roll Count – Manual Adjustment.

To manually adjust the Roll Count:

- Press **Pad '1' (Stop)** on the **Active Stacking Screen**. The Inactive Screen will be displayed.
- Press the **'OK' Pad (Step Sequence)**, this will bring up the **'Step Sequence'** screen, showing a pallet with Rolls placed on it.
- The **'Step Sequence'** Screen indicates that the **'Right' Arrow** is **'Next'** and the **'Left Arrow'** is **'Prev'**. These indicator Pads are used to **'add'** or **'subtract'** sod layers from the pallet.

Cont...

IMPORTANT

If there were 15 Rolls on the Pallet, and the Robotic Arm action was stopped at the mid point of stacking Rolls 16 to 20, after the sequence was re-started, and Rolls 16 to 20 were manually placed on the pallet, it would be necessary to go to 'Step Sequence', and press the 'Next' Pad to add rolls 16 to 20 to the pallet.

If 'forward travel' was stopped, after the stacking sequence was stopped, it may be necessary to 'manually' adjust the number of Rolls on the Index Conveyor. The Rolls will have to be manually re-positioned on the Index Conveyor because the Index Conveyor will not move **'back'** when the Stacking Sequence is stopped.

After the Rolls are positioned correctly on the Index Conveyor, return to the **'Step Sequence Screen'** and use the **'Up'** and **'Down Arrows' Pads** to adjust the number of Rolls on the Index Conveyor, indicated **'Plus'** and **'Minus'** on the Screen. Use the **'Up Arrow' (Plus)**, and the **'Down Arrow' (Minus)**, to adjust the number of Rolls shown on the Screen Display, until they match the number of rolls on the Index Conveyor. When the number of Rolls on the Screen Display, the Index Conveyor and the Pallet are the same, the Stacking Sequence can be re-started.

Restarting the Stacking Sequence.

If the Roll Count was manually adjusted:

- Press **Pad '1' (OK)**, to return to the **Inactive Stacking Screen**.
- Press **Pad '1' (Start)**, to start the stacking sequence and return to the **Active Stacking Screen**.
- Resume cutting, and the Stacking Cycle will continue.

If the Stacking Cycle was stopped after the Robotic Arm had completed its cycle and returned to the **'Home'** position, over the Index Conveyor:

- Press **Pad '1' (Start)**, on the **Inactive Stacking Screen**, to start the Stacking Sequence and return to the **Active Stacking Screen**.

Partial Pallet

If a 'partial pallet' is required, that is a pallet with less Rolls than the selected stacking pattern, follow the instructions below for the recommended procedure.

- When the Rolls required for the 'partial pallet' are on the pallet, 'stop the forward' travel of the harvester.

- Press and **'Hold' Pad '5'**, for **'Full Pallet'** Screen, and then proceed normal operation.

Suggestions for better 'Stacking'.

Brouwer incorporates the latest technology for mobile equipment, in the electronics and hydraulic systems on its harvesters, to ensure that the customer has reliable and user friendly automatic machines.

The operation of the Robomax Harvester is straight-forward, however, variations in sod rolls and in the local field conditions, require that the operator is aware at all times of such variations.

The following suggestions will help the operator to 'stack' consistent pallets of sod.

- The 'integrity' of a stacked pallet of sod depends on the consistency and quality of the sod rolls. Poor quality rolls result in pallets with low integrity. It is important that the operator maintains roll consistency and grades the rolls as they are harvested. Inferior rolls should be 'ejected' before the Robotic Arm transfers rolls to the Index Conveyor.
- Roll size, (diameter), and their vertical stacking position on the pallet are related. To stack a pallet correctly, The Gripper Head should come 'down' to just touch the rolls on the Index Conveyor, before the Gripper Fingers 'close' and grab the rolls. This pick-up height is adjusted by selecting the correct roll size on the display screen.
- Selecting a 'too small' roll size commands the Robotic Arm to compress the rolls as they are picked from the Index Conveyor and transferred to the pallet. Compression of the rolls when being stacked results in increased cycle times and reduced efficiency.
- Selecting 'too large' roll size results in the rolls being 'dropped' onto the pallet. This leads to pallets with less than the desired integrity.

Adjustments can be made to the 'stacking positions'. To determine if adjustment is necessary:

- Harvest at least five pallets of sod, noting the specific stacking position that may require adjusting. If the five pallets show the same stacking inconsistency, stacking position adjustment is necessary. Consult your Brouwer Dealer, or the Factory, for advice on this procedure.

SECTION 4

Maintenance.

Maintenance Schedule	4-1
Hydraulic System	4-2
Hydraulic Oil Specification	4-2
Hydraulic Oil Filters	4-3
Manifolds and Valve Stacks	4-4
Main Motor Manifold	4-4
Index Conveyor - Flow Control Orifice replacement	4-4
Gripper Head/Pallet Lift Forks Manifold	4-4
Proportional Valves Stack	4-5
Conveyor Lift Safety Lock	4-6
Cutter Drive . V-Belt	4-6/4-7
Crankshaft Assembly	4-8/4-10
Main Conveyor Drive	4-11
Crown Roller	4-11
Mat Tension Idler	4-11
Mid-Idler Mat Support. 4in. Roller Drive	4-11
Rubber Conveyor Mat – Splices and Clips	4-12
– Installation	4-13
Mintex Metal Mat	4-14
Rubber Conveyor – Mat Sliders	4-15
Roll-up Conveyor Stops	4-15
Blank page.	4-16
Lubrication Points	4-17

Maintenance Procedure	DAILY	FIRST 25	EVERY 50 HOURS	EVERY 100 HOURS	EVERY 250 HOURS	EVERY 750 HOURS
ENGINE. Refer to the Tractor Manufacturers Manual for additional maintenance information and instructions.						
Check/Top-off Engine Coolant Level.	X					
Check/Top-off Engine Oil Level.	X					
Check for Water/Oil Leaks.	X					
Clean Air Intake Screen.	X					
Clean Radiator Cooling Fins.				X		
Clean Air Cleaner Pre-cleaner. Clean Air Cleaner Element. Change Engine Oil and Filter.	} Refer to the Tractor Manufacturers Manual.					
HYDRAULIC SYSTEM.						
Check for Oil Leaks.	X					
Top-off Oil Level.				X		
Change Hydraulic Oil.						X
Change Main In-Tank Filter						X
Change High Pressure Filter.		X		X		
MACHINE						
Check Fasteners and Fitting.	X					
Check Chains and Sprockets.	X					
Check Tire Pressure. Front Tire Pressure. 30 psi. Right Rear Tire Pressure. 34 psi. Left Rear Tire Pressure. 18 psi.	} NOTE Left Rear Tire is ballasted with Calcium Chloride solution to balance conveyor weight. A special Gauge is required to check the pressure in liquid filled tires. See your Dealer.					
Check/Sharpen/Repl. Cutter Hd. Blades.	X					
Check Top-off Battery.				X		
Check/Adjust /Replace Cutter Drive Belt.	X					
Check Conveyor Belts.	X					
Check Main Conveyor Slides.	X					
Check Lug Nut Torque –To 188 ft.lbs.		X		X		
STORAGE: Maintain Proper Tire Pressure. Remove Battery and Maintain Charge. Grease Hydraulic Cylinder Rods.						

MAINTENANCE

HYDRAULICS

Hydraulic System.

At the factory the Hydraulic System is filled with **PETRO-CAN HYDREX XV - All Season Hydraulic Oil**. It is a Premium performance, long life, anti-wear hydraulic fluid.

IMPORTANT
Use ONLY recommended oil.

The Specification Chart below shows the typical characteristics of **HYDREX XV**.

Contact your local oil dealer, for an oil that has the same characteristics, if **HYDREX XV** is not available.

The RoboMax Hydraulic System uses a three section Hydraulic Pump 'A', to supply hydraulic power to the Cutter Head, the Conveyors, Pallet Lift, and the Robotic Arm.

The pump drive is from the front of the tractor engine. Internal tractor hydraulics operate the Main Conveyor, Cutter Head Lift and the Depth of Cut.

The Hydraulic Tank 'B', mounted at the front of the Harvester, contains hydraulic oil for the external hydraulics. The Main Filter 'C' mounts into the tank.

Oil Coolers with electric fans are provided to keep the oil temperature within the operating range. The Cooling Fans will switch on automatically when the oil reaches a set temperature, measured by a sending unit in the hydraulic tank.

All external hydraulics are routed through manifolds that direct the oil flow to the Motors and Cylinders. Each manifold is marked to aid in the hose routing and trouble shooting.

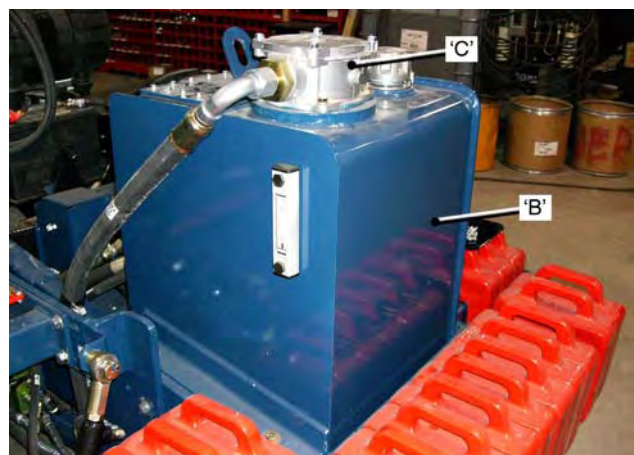
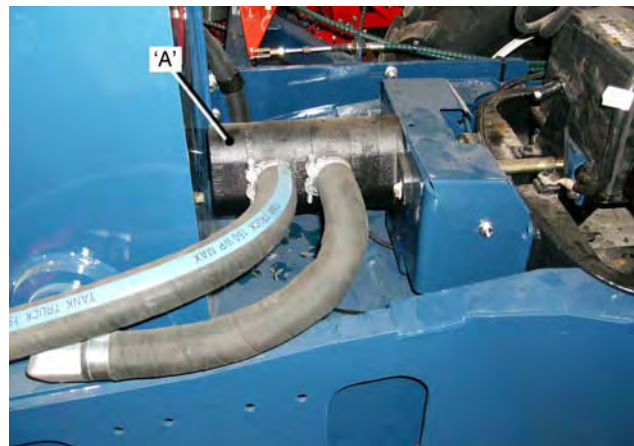
There are several bulkheads where hoses connect. These bulkheads are labeled with hose locations and the hoses are marked with part numbers to aid in hose routing.

IMPORTANT

To prevent serious damage to the Hydraulic System do not allow water, dirt, debris or contaminants to enter the System.

When working on/repairing hydraulic components thoroughly clean around the area to be worked on. Cap and plug all broken connections.

HYDREX XV. OIL. Specifications.	
Viscosity cSt @ 40deg. C	43.2
cSt @ 100deg.C	10.5
SUV @ 100deg. F	201
SUV @ 210deg. F	61
Viscosity Index.	245
Flash Point. Deg.C/Deg.F	245/473
Pour Point. Deg.C/Deg.F	-48/-54
Oxidation Stability, hours to 2.0 TAN.	10,000 +
Min. Start-up Temp. Deg.C/Deg.F	-40/-40
Operating Range. Deg.C	-18 to 75
Deg.F	0 to 167

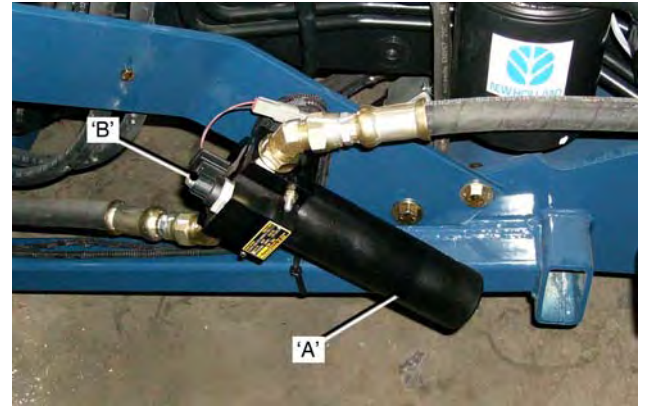


MAINTENANCE

Hydraulic System.

High pressure Filter.

For additional protection to the Proportional Valves, that control the Robotic Arm, a High Pressure Filter 'A', is installed between the Hydraulic Tank and the Proportional Valves. It is mounted on the left side of the tractor, aft of the left front wheel.

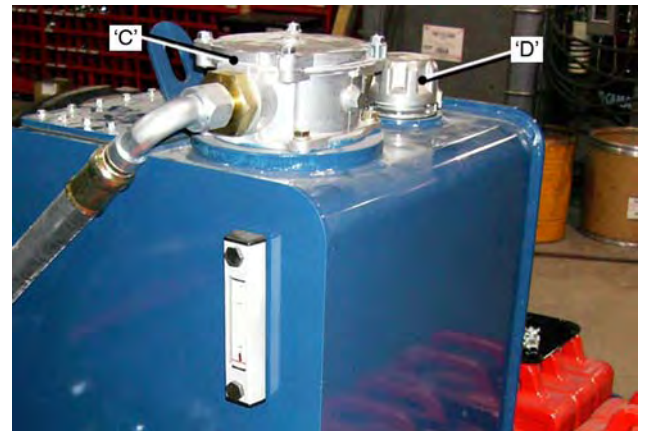


The Filter Cartridge should be changed after the **initial 25 hours of operation**, and then **every 100 hours**, or at any time the Gauge 'B' on the Filter indicates that the filter efficiency is reduced. When the Filter Cartridge reaches this point, a switch in the filter head 'closes', and the **RED** Indicator Flag is activated. Also a signal is sent to the Control Panel Display to warn the operator that 'filter service' is necessary.

Main In-Tank Filter.

It is recommended that the In-Tank Filter Element is changed **every 750 hours**.

- Before loosening the bolts in the Top Plate 'C', open the Filler Cap 'D' to relieve tank pressure.
- Press **'DOWN'** on the Top Plate, against spring pressure, at the same time turn it 'counter clockwise' to remove it.
- Check the Top Plate O-Ring 'E'. Replace it if it is damaged.
- Clean the Magnet 'F' of any metallic residue.
- Remove the used Cartridge 'G' from the tank. Install a new Cartridge. Check that the O-Ring is correctly seated in the Top Plate and all surfaces are clean.
- Refit the Top Plate by pressing 'DOWN' and turning 'clockwise' to locate it against the bolts and tighten the bolts.

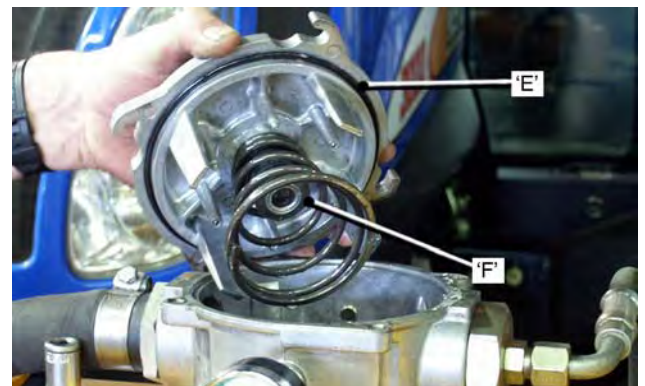


IMPORTANT

When the Filter or Filler Cap are removed during service, cover the tank openings to prevent any dirt, debris or other contaminants from entering the tank.

It is recommended that the Hydraulic Oil is changed every 750 hours or annually, when the Main Filter is changed.

- Always drain the oil into an approved container.
- Clean and replace the 'magnetic' drain plug.
- Refill the tank using only an approved hydraulic oil as shown on page 35.
- Fill to the correct level indicated on the Sight Glass 'H', on the oil tank. **DO NOT** overfill.



IMPORTANT

To ensure maximum cooling, do not stack sod on the front tractor weights. If more front weight is needed add more weights, or ballast the front wheels.

MAINTENANCE

Hydraulic System.

Manifolds and Valve Stacks.

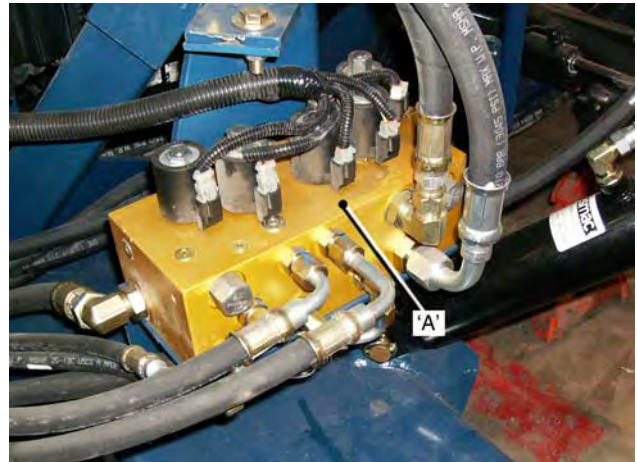
Main Motor manifold.

The Main Motor Manifold 'A', is located on the right side of the tractor between the Conveyor and the Tractor.

The Motor Manifold receives approximately 15 gallons per minute from the 'center' section of the Hydraulic Pump. The flow is then directed through Solenoid Valves in the manifold, to the:

- Cutter Head Motor.
- Main Conveyor Motor.
- Roll-up Conveyor Motor.
- Index Conveyor Motor.

Relief pressure in the manifold is set at the factory at 2650 psi.

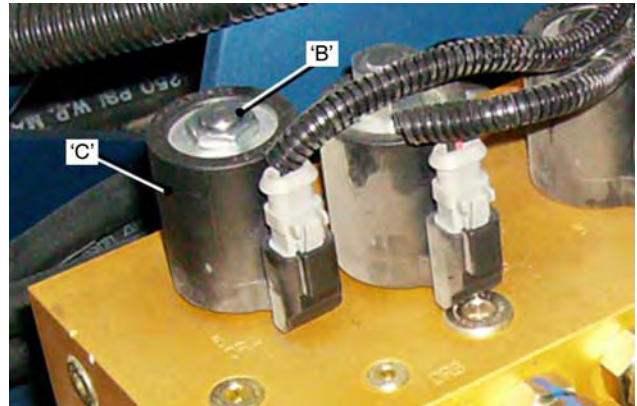


Index Conveyor Flow Control Orifice.

If the Index Conveyor movement slows noticeably the fault may be with the Flow Control Orifice located under the Index Conveyor Spool.

To install a new Orifice:

- Remove the Nut 'B', and the Coil 'C'.
- Use a Hex Socket to carefully unscrew the Valve/Spool Assembly from the Manifold.
- Use a magnet to 'reach in' and remove the faulty Orifice from the Manifold.
- Install the new Orifice.
- Check that the O-Ring under the head of the Valve/Spool Assembly is not damaged, replace if necessary.
- Screw the Valve /Spool Assembly into the Manifold.
- Refit the Coil 'C', and Nut 'B'. Tighten the Nut to 12 ft.lbs. **Do not over-tighten** the Nut as it may result in damage to the Coil.



Gripper Head/Pallet Lift Forks Manifold.

The Gripper Head/Pallet Lift Forks Manifold 'D' is located in front of the right side Pallet Forks Lift Cylinder. It receives approximately 7 gallons per minute

from the front section of the Hydraulic Pump. The flow is then directed, through solenoid operated valves in the manifold to the:

- Gripper Head Fingers.
- Gripper 'Squeeze' Function.
- Pallet Lift Forks Cylinders.

Relief pressure in the manifold is set at the factory at 1500 psi.

A check valve limits the pressure to the Gripper fingers to 900 psi.



MAINTENANCE

Hydraulic System.

Proportional Valves Stack.

The Proportional Valve Stack Assembly is mounted above the left rear wheel. It receives approximately 30 gallons per minute from the 'rear' section of the Hydraulic Pump.

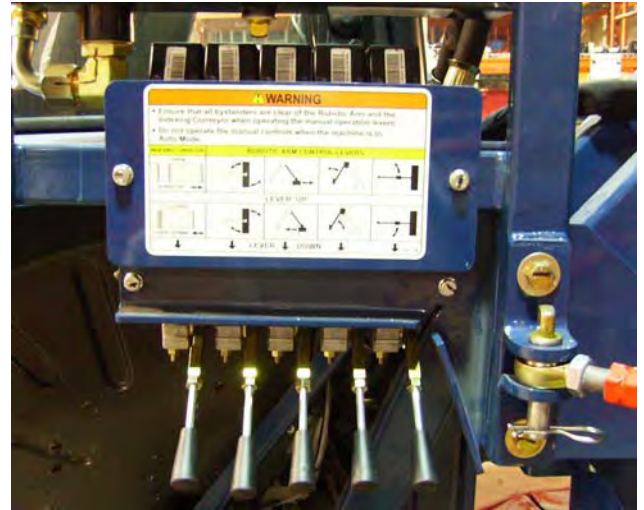
The oil flow is directed through four of the valves, to the Hydraulic Cylinders that control the functions of the Robotic Arm.

There is also a valve that controls the operation of the Roll Eject.

All functions are controlled by the on-board computer.

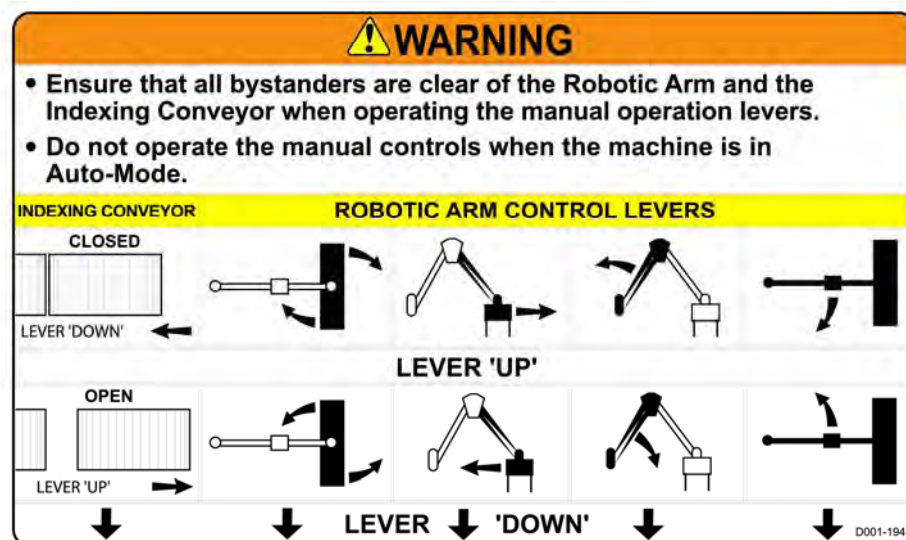
The Proportional Valves can also be 'manually' operated for the Robotic Arm and the Index Conveyor. This may be necessary if the computer is malfunctioning, when the system is set to 'manual mode', or during service procedures.

Relief pressure in the manifold is set at the factory at 2700 psi.



IMPORTANT

Do not change the relief valve pressures, unless authorized by the factory service department.



MAINTENANCE

Conveyor Lift Safety Lock.



WARNING

To prevent possible serious injury the Conveyor Lift Cylinder Lock **must be in place** when working on the Cutter Head in the raised position.



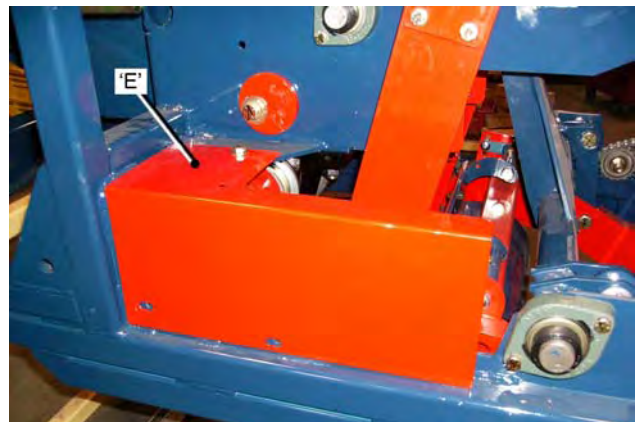
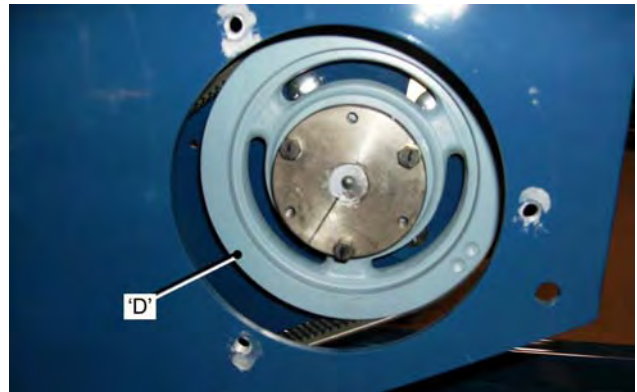
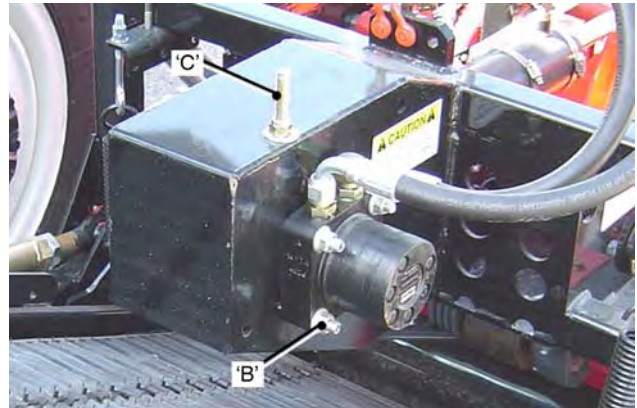
CAUTION

To prevent possible damage to the machine, when the Cutter Head is raised for transport, the Conveyor Cylinder Lift Cylinder Lock must be in place.

The Safety Lock 'A' is installed to prevent the Lift Cylinder retracting, from accidental operation, or from loss of hydraulic pressure. Raise the Conveyor 'fully' to fit the Cylinder Lock into place.

Cutter Drive – V-Belt. Remove/Install.

- Raise the Cutter Head and place the Cylinder Lock 'A' in position.
- Loosen the Drive Motor Mounting Bolts 'B', and the Drive Belt Tension Adjuster 'C'. Push the Motor 'down' to slacken the Drive Belt.
- Remove the Drive Motor Housing Cover, and remove the Belt from the Sheave 'D'
- Remove the Cutter Arm Cover 'E', to access the Connecting Rod.



Cutter Drive Belt – Remove/Install.

- Pull the Cutter Arm 'F' 'back'. Remove the top section of the Connecting Rod Bearing Cap, and allow the Connecting Rod 'G' to swing 'downwards'.
- Remove the Nuts 'H' from the Crankshaft Bearing Bolts.

NOTE

Use a 'crowfoot' wrench to hold the head of the rear bearing bolt. (It is difficult to reach because of the Tension Spring).

Use a 'pry-bar' 'J', to lever the bearing 'down' sufficient to remove the Drive Belt.

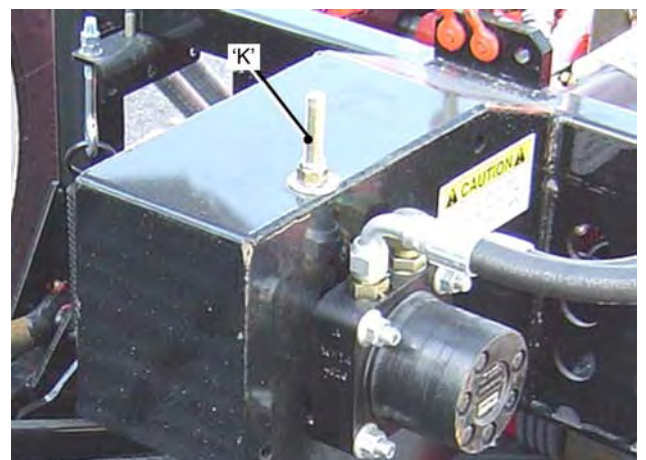
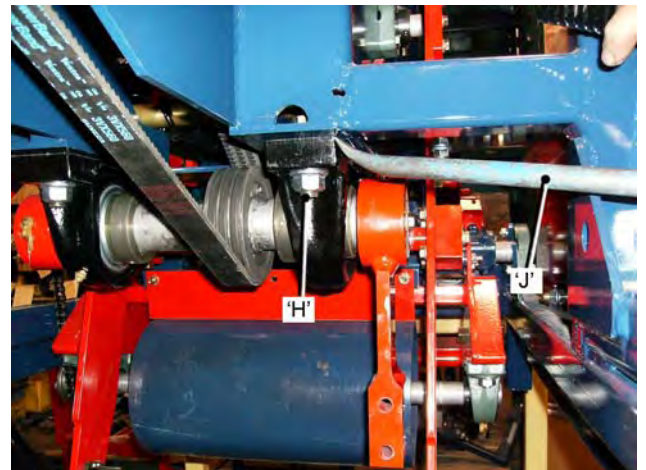
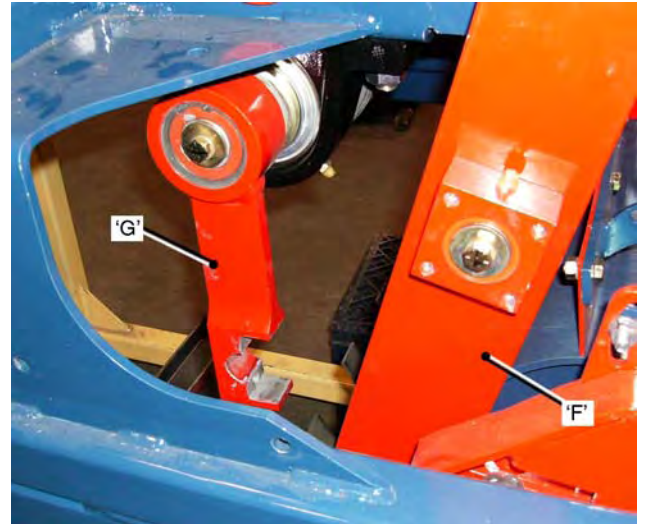
Install the new Drive Belt and re-assemble in the reverse order. Take care to tighten all fasteners to their correct torque.

To adjust the tension of the Drive Belt:

- With the Drive Motor mounting bolts 'loose', turn the Drive Belt Adjusting Nut 'K' clockwise to tension the belt, until there is ¼ to 3/8 inch de-flection at a point midway between the Drive Motor and the Crankshaft sheaves.
- Tighten the mounting bolts locknuts and replace the cover plate.

IMPORTANT

Do not over tension the Drive Belt, as this may result in premature wear and motor bearing failure. Check the belt tension after 20 to 30 hours of operation.



MAINTENANCE

To Service Crankshaft/Connecting Rods Assembly.

Remove Crankshaft Assembly

To remove the Crankshaft/Connecting Rods Assembly, follow the instructions for removing the Drive Belt, as shown on pages 4-6 and 4-7. (16/18 in. ass'y. shown). From that point proceed as follows:

- Remove the left hand Connecting Rod Bearing Cap 'A'. Let the Connecting Rod swing 'down'.
- Remove the Lock-nuts from the left side Crankshaft Bearing 'B', and remove the Crankshaft Assembly.



CAUTION

To prevent possible injury to the hands, exercise care when removing the Crankshaft Bearing fasteners. The Crankshaft Assembly is heavy. Lower it carefully.

To remove the Connecting Rod Bearings:

- Remove the Connecting Rod Retainer Bolt 'C'. Use a 'Puller' to remove the Connecting Rod and Bearings from the Crankshaft.
- Remove the Snap Rings 'D', and press the Bearings 'E', out of the Connecting Rod.

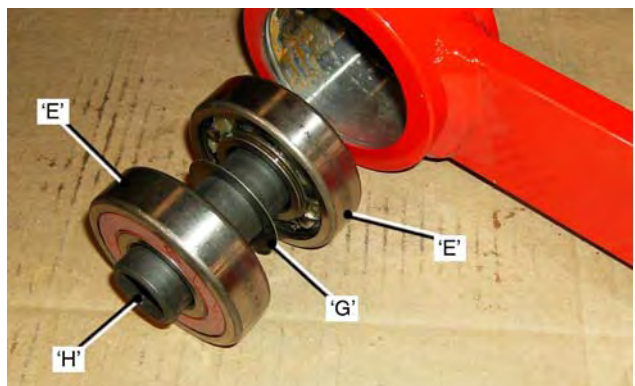
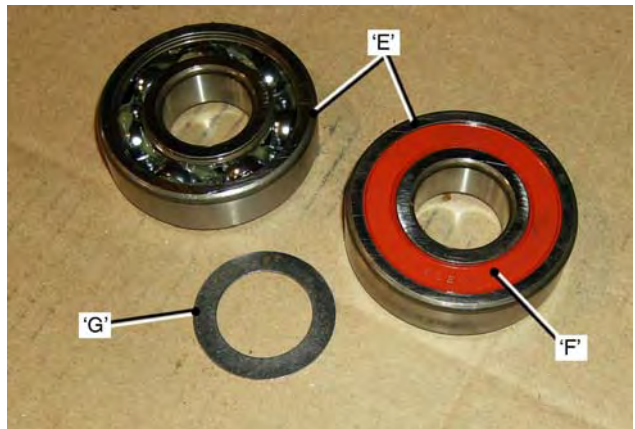
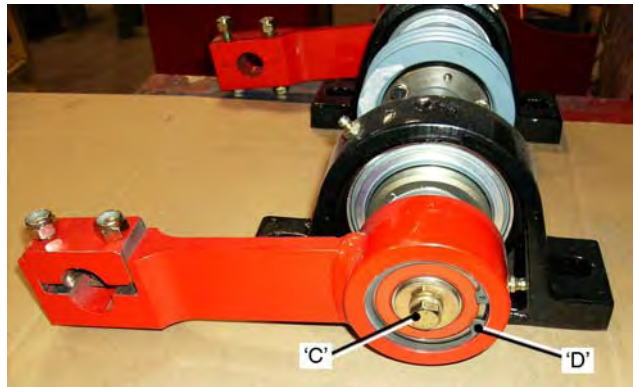
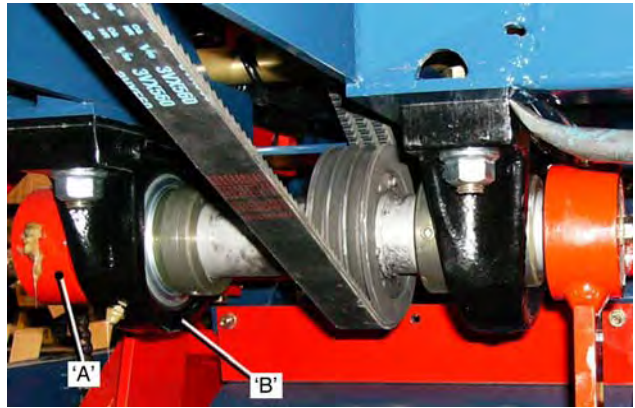
To install new Bearings:

Before installing new bearings the Grease Seal 'F', **on one side of the bearing, must be removed**. Pack the bearings with grease. Bearings must be installed with the remaining Grease Seal facing 'out'.

- Fit one Snap Ring 'D' and press in a Bearing 'E', until it 'just' contacts the Snap Ring. Do not apply too much pressure as it may damage the Snap Ring and/or the Ring Groove. To prevent damage to the Bearings, always press them 'IN' by the 'outer' race.
- Install the Shim 'G'. See note.
- Press-in the second Bearing and fit the second Snap Ring.

NOTE

Use a 'Dummy' Shaft 'H', to center the Shim in the Bearings. The Shim separates the Bearings allowing grease to reach the bearings.



Crankshaft Bearings and Sheave.

To remove the Crankshaft Bearings:

- Remove the Connecting Rods. See page 4-8.
- Back-off the Lock-Collar Set Screw.
- Use a suitable Drift or Punch to release the Lock-Collar 'A'.

NOTE

Lock-collars are 'tightened' in the direction of rotation, and released in the opposite direction.

- If the Crankshaft is to be re-used, carefully clean-up the shaft ends, where the Connecting Rod Bearings fit, and remove the Crankshaft Bearings.

To remove/install the Crankshaft Sheave:

- Remove the three Bushing Bolts 'B'.
 - Fit three bolts into the threaded holes 'C' and tighten them 'evenly' to release the Taper Lock Bushing 'D'.
- Remove the Sheave from the Shaft.

NOTE

Apply 'Anti-Seize' to the Crank Shaft when fitting the Bearings and Sheave, to ease assembly and prevent rust/corrosion forming.

When fitting a new Sheave, slide it onto the Shaft, but do not tighten the Taper Lock Bushing Bolts, it will have to be aligned with the Drive Motor Sheave when the Crank-Shaft Assembly is installed in the frame.

IMPORTANT

If the Crankshaft Assembly is for a 24 inch machine the Driven Sheave **must be fitted** with the Taper Lock Bushing Facing as shown. This gives clearance from the Counter Balance Weight 'E' and allows the Bushing Bolts 'B', to be removed/replaced.

Also Shim Plates are fitted between the Bearings and the Frame to prevent the Counter Balance Weights from 'jamming' against the frame.

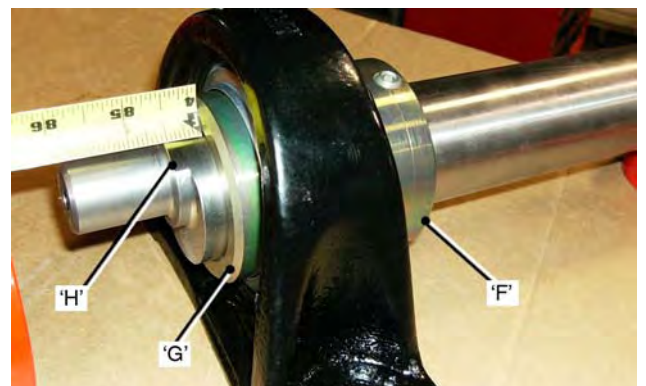
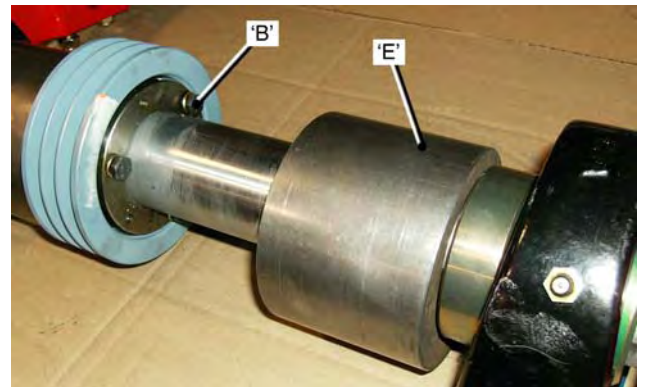
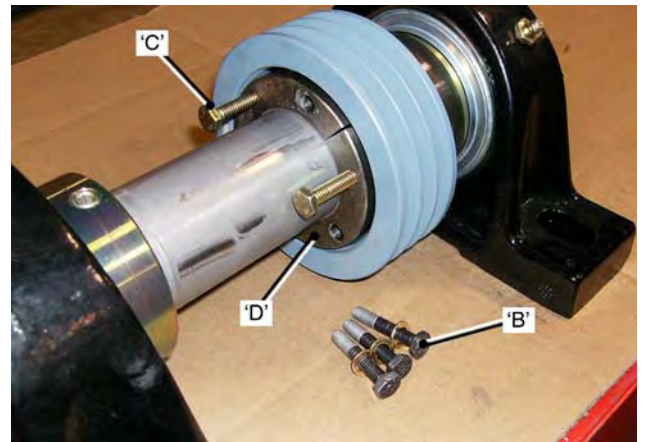
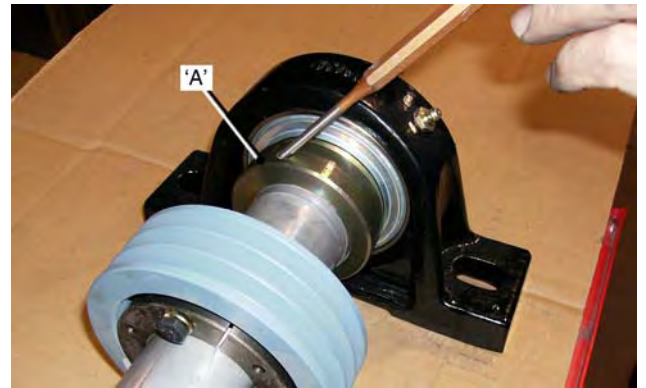
See page 4-10 for removal of Counter-Balance Weights.

Fitting new Crankshaft Bearings:

- Check that the Shaft is free of scratches, marks or rust, that will hinder assembly.
- Fit the Bearings onto the Shaft, with the Lock-Collars 'F' facing 'inwards'.
- Position the Bearings as shown, with the face 'G' ½ inch from the shoulder 'H' on the shaft. Tighten the Lock-Collar 'A' and the Set Screw..

Fit the Connecting Rods, Washers and Retainer Bolts onto the Crank-Shaft.

The assembly can now be installed into the frame.



MAINTENANCE

Crank-Shaft Assembly - 24 inch Machine.

The Crank-Shaft on 24 inch machines has two Counter Balance Weights 'A'. They are Keyed to the Shaft and locked with Set Screws.

It is necessary to remove one of the Weights if the Driven Sheave needs to be removed.

To remove the Counter Balance Weight:

- Remove the Crank-Shaft Assembly, see page 4-8.
- Remove a Connecting Rod. See page 4-8.
- Remove a Crank-Shaft Bearing. See page 4-9.
- Back-off the Set Screws 'B', and slide the Weight off the Shaft. Remove the Key 'C'.
- Remove the Driven Sheave. See page 4-9.

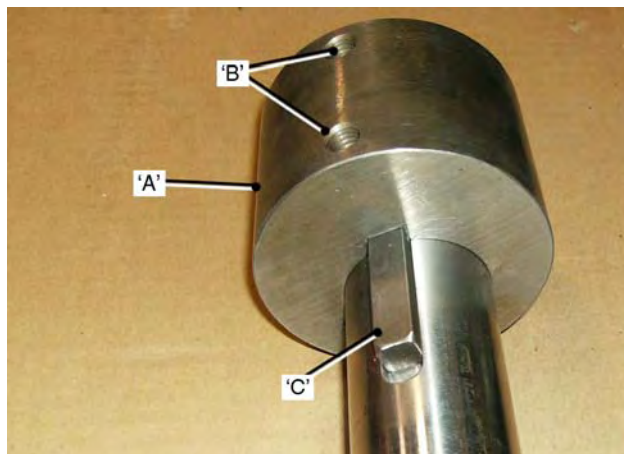
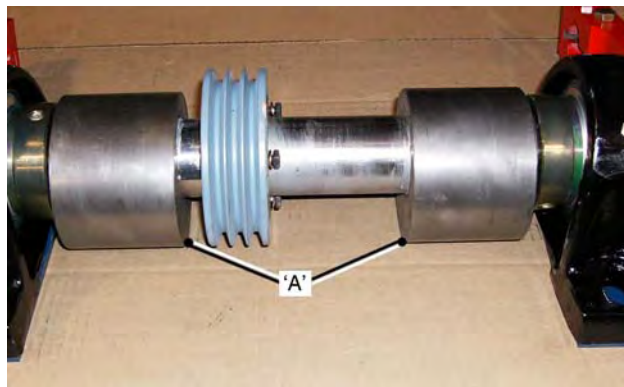
On re-assembly the Counter Balance Weight should be located against the Bearing Lock-Collar.

IMPORTANT

When installing the 24 inch Crank-Shaft Assembly into the frame, the Shim Plates 'D' **must be fitted between the Bearing Flange and the Frame** to allow the Counterweights to clear the Frame.

Installing Crankshaft Assembly.

- Fit a new Drive Belt over the Drive Motor Sheave.
- Carefully raise the Crankshaft Assembly into position and bolt it into place.
- Fit the Drive Belt, with 'slack', onto the Crankshaft Sheave
- With a 'Straight Edge' 'E', align the Crankshaft and Drive Motor Sheaves, then tighten the Bolts in the Crankshaft Sheave Taper Lock Bushing.
- Adjust Drive Belt tension as shown on page 4-7



Main Conveyor Mat

The Rubber Conveyor Mat was initially used in areas with abrasive soil conditions, but has proven to work well in a variety of conditions. It is the preferred choice of most Sod Growers. See page 4-12 for the installation of a new Mat and Metal Clip replacement.

Conveyor Mat Drive

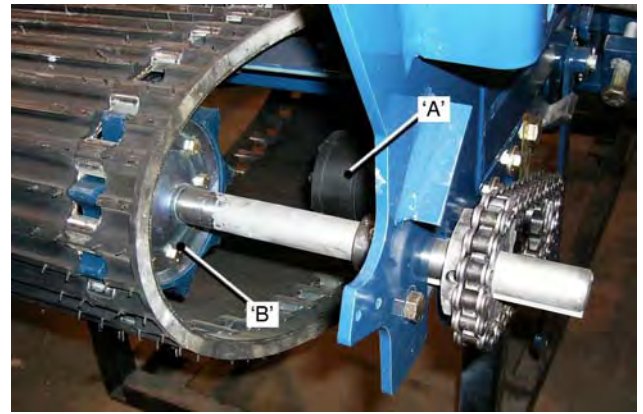
A Hydraulic Motor 'A' drives Sprockets 'B' that run in 'slots' in the mat.

The 'slots' are fitted with replaceable Metal Clips.

See following pages for Clip replacement.

To prevent premature/excessive wear, the Sprocket Teeth **must be 'centered'** in the 'slots'.

See following pages for alignment procedure.

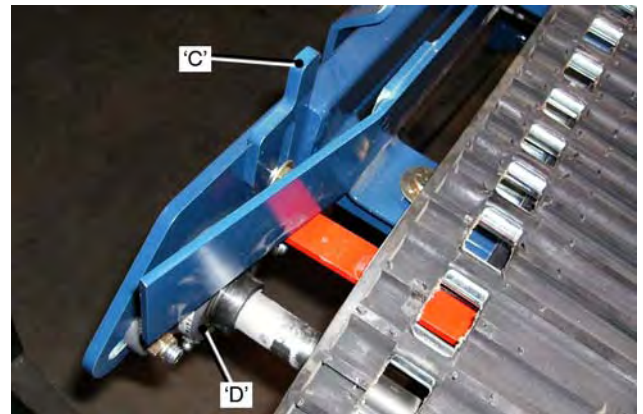


Crown Roller

A Crown Roller, at the front of the Conveyor, keeps The Mat 'tracking' square to the conveyor frame.

The Roller is aligned in the frame with adjustable Tapered Wedges 'C' located at each Roller Shaft Bearing 'D'.

See following pages for alignment procedure.



IMPORTANT

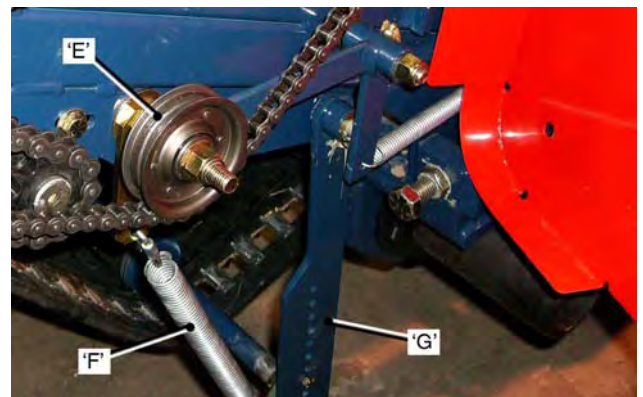
The Crown Roller Must be set so that the Sod Guide Bracket does not 'foul' against the Conveyor Mat during operation.

Initially set the Crown Roller at the mid-point of adjustment, determined by the back stroke of the Cutter Blade, and with allowance for the thickness of the Conveyor Mat. Also allow for some forward movement of the assembly during final alignment.

Mat Tension Idler.

Tension on the Conveyor Mat is maintained by adjustable Tensioned Idlers 'E'.

The Tension Springs 'F' can be adjusted in a series of holes in the Idler Arm 'G'.



IMPORTANT

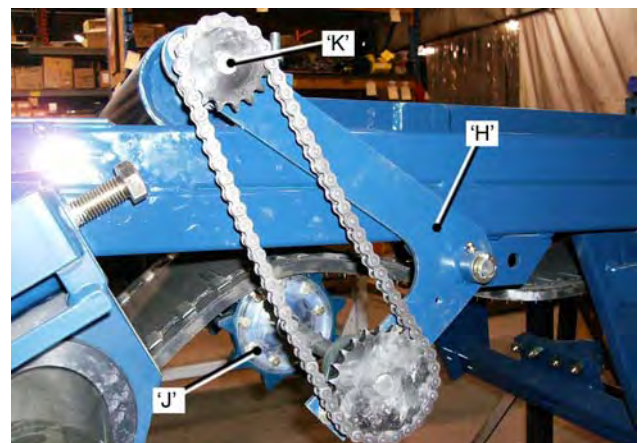
Do not allow the Idler Arm to approach an angle of 90 degrees relative to the Conveyor Frame.

If this occurs the Idler Arm will be pulled 'over center' and tension in the Conveyor Mat will be lost.

Mat Support. 4 inch Roller Drive.

The Mid-Idler Shaft and Sprockets Assembly 'H', supports the Conveyor Mat below the Conveyor Frame.

Sprockets 'J' on the Idler Shaft drive the 4 inch Feed Roller 'K'.



MAINTENANCE

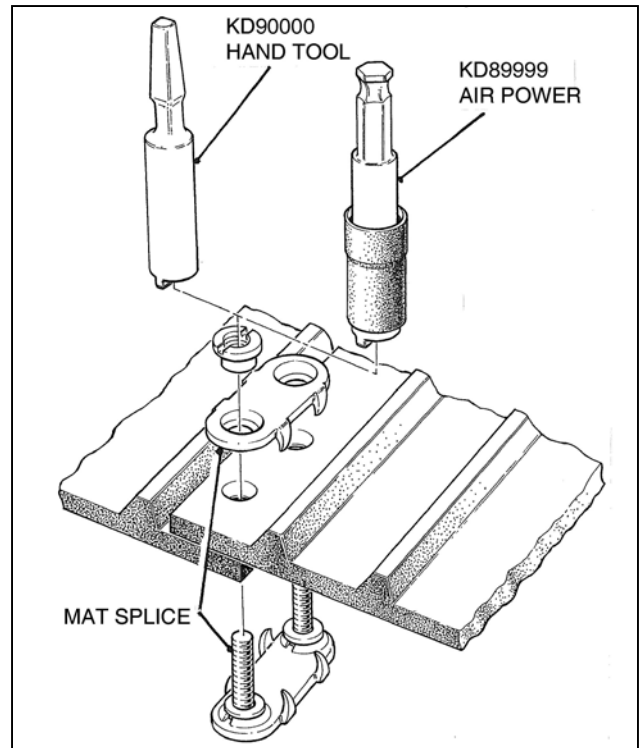
Rubber Conveyor Mat.

Mat Splices.

The Conveyor Mat is joined with Metal Splices. The Mat must be joined with the lower part of the Mat over-lapping the upper part. It is important that any excess portion of the Threaded Stud is broken off above the Nut when the Splice has been installed. Special Tools are available for easy removal and installation of the Mat Splices.

Type 'A' is for use with Air Power.

Type 'B' is for use with a hand tool.



MAT SPLICE INSTALLATION

Mat Clips.

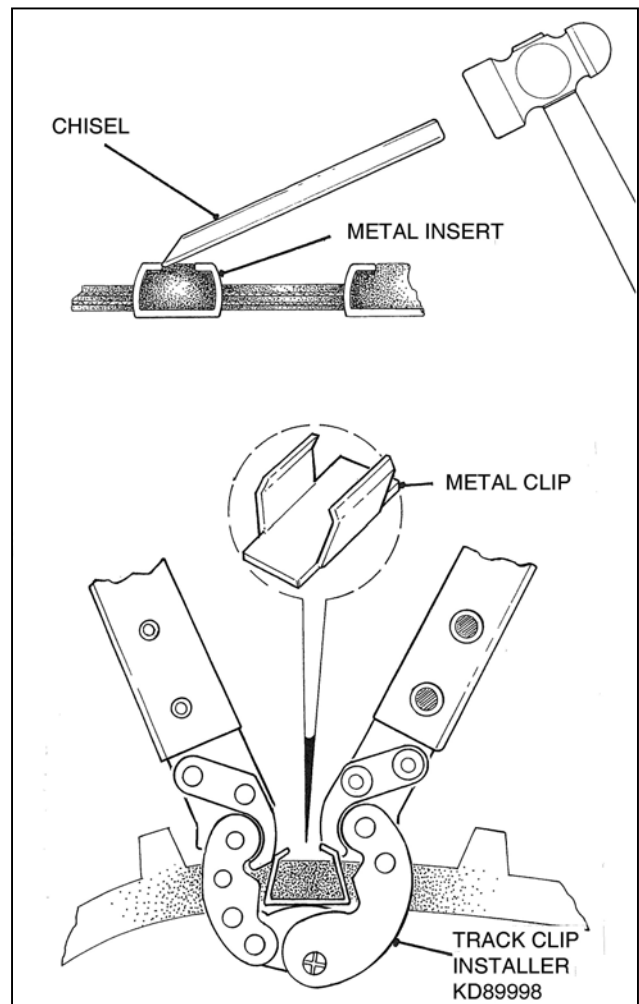
The Metal Mat Clips will wear and need replacing. Use a chisel or similar tool to open them up for removal. A Special Tool (Part No. KD89998) is available to make installation fast and safe.



WARNING

Do not operate the Conveyor unless the Stud Ends have been broken off.

Failure to observe this precaution may result in serious injury to the operator, and/or damage to the machine.



MAT CLIP REMOVE/INSTALL

MAINTENANCE

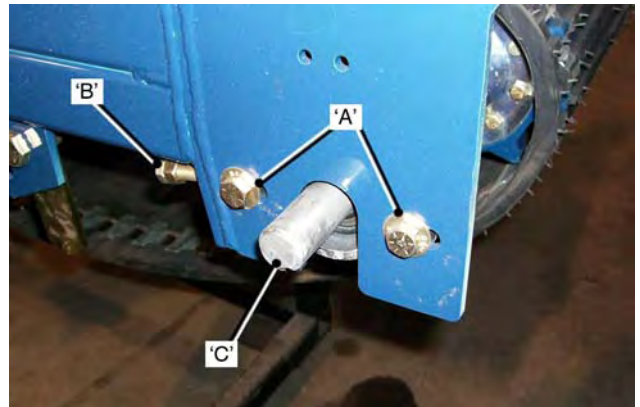
Conveyor Mat Installation.

When the Conveyor Mat has been installed into the Frame and onto the Sprockets, and has been 'joined' with Mat Splices, it will be necessary to align the Mat so that it runs 'parallel' in the Frame.

The Mat is kept in alignment by the Driving Sprockets at the top of the Conveyor, and the Crown Roller at the front bottom of the Conveyor.

Drive Sprocket Shaft Alignment.

- Tighten the Shaft Bearing mounting bolts, at the right hand side of the Conveyor.
- Loosen the left hand side Bearing Bolts 'A'. Screw the Adjusting Bolt 'B,' 'IN' until the Shaft 'C' is at 90 degrees to the Frame. Tighten the Adjusting Bolt and the Lock-nut.



Crown Roller Alignment.

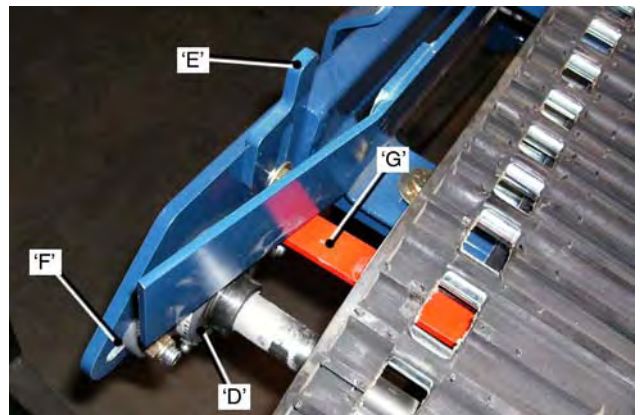
- Loosen the Bearing Bolts 'D' and the Adjusting Wedges 'E'. Tap the Wedges 'down' to position the Crown Roller Shaft in the center of the Adjusting Slots 'F'. (on both sides of the frame). Do not fully tighten the fasteners, to allow for final alignment adjustment.



CAUTION

Adjustments **must be done by two people.**

One person to operate the controls and the other to make the adjustments.



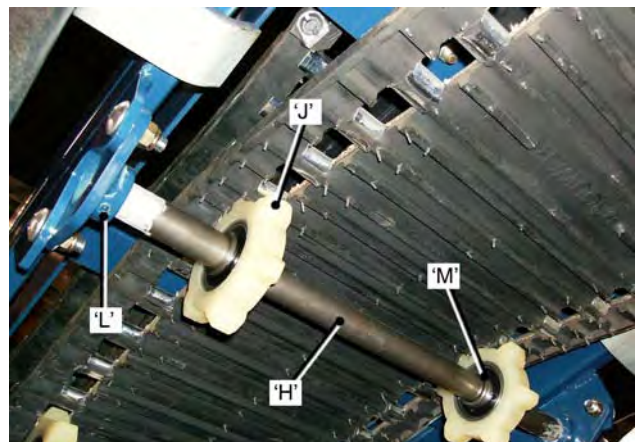
- Run the Conveyor at **LOW SPEED**.
- Observe if the mat tracks to the '**left**' (inner side of the frame), tap the '**right side**' Adjusting Wedge '**down**'.
- If the mat tracks to the '**right**' (outer side of the frame), tap the '**left side**' Adjusting Wedge '**down**'.
- Adjust until the Mat runs parallel to the frame.
- Stop the Conveyor.
- Tighten all fasteners.
- Set the Roller Scraper 'G' to 1/32 in from the Roller.

Idler Sprocket Shafts.

Two Idler Sprocket Shafts 'H', are located to the rear of the Crown Roller, (rear-most one shown).

The Sprockets 'J', on the Idler Shaft must be adjusted to run centrally in the Mat Slots.

- Install the Sprockets 'J' loosely onto Shafts 'H'.
- Fit the Shafts and Bearings into the frame and lock into place with Set Screws 'L'.
- Position the Sprockets with the 'teeth' in the center of the Mat Slots.
- Tighten Set Screws 'M', in the Sprocket Bearings.



MAINTENANCE

Mintex Metal Mat

There are no replacement parts in the Mintex Mat. Replace it as an assembly.

To ensure a long service life, it is important that the Mat Drive Shaft, Idler Shafts, Idler Sprockets and Rollers Assemblies are parallel to each other and correctly set 'square' in the Frame.

NOTE

The links, at the outer edge of the Mat must point 'opposite' to the direction of mat travel.

Drive Sprockets.

- The teeth of the Drive Sprockets 'A' must contact the Mat Connectors. The Drive Sprockets are keyed to the Drive Shaft and locked with Set Screws.

Mid-Idler Sprockets.

- The Mid-Idler Sprockets 'B' rotate freely on the Shaft and held in place with Lock Collars 'C'. They are 'pushed' by the fixed Mat Connectors. Set the Idler Sprockets one inch closer to the Center of the Mat than the Drive Sprockets.
- Sprocket Teeth **must be centered** in the Mat openings. If the Teeth contact the side face of the Links it will result in excessive and premature wear to the Sprockets and the Mat, and early failure of the Mat.

IMPORTANT

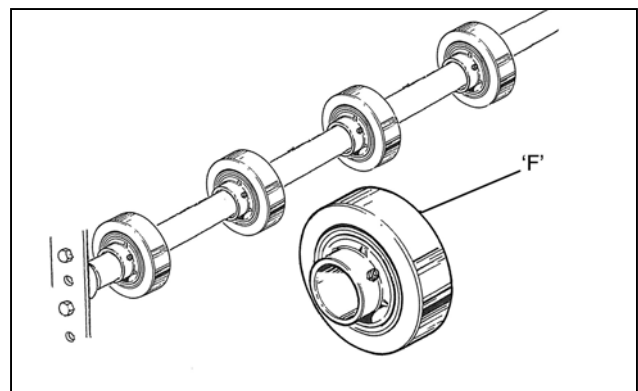
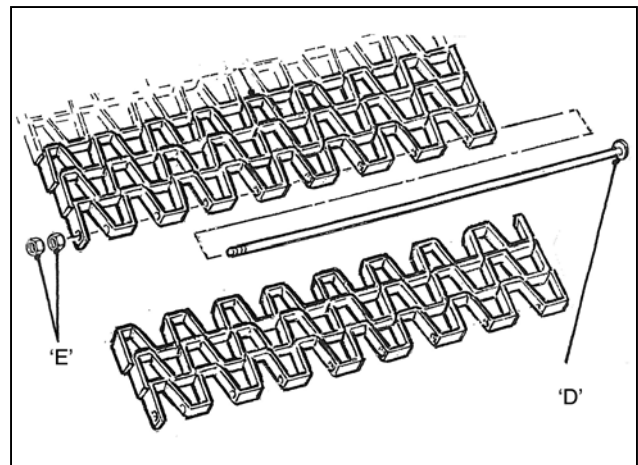
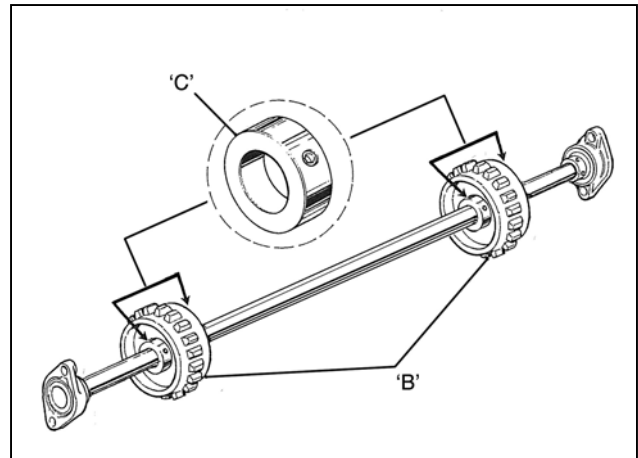
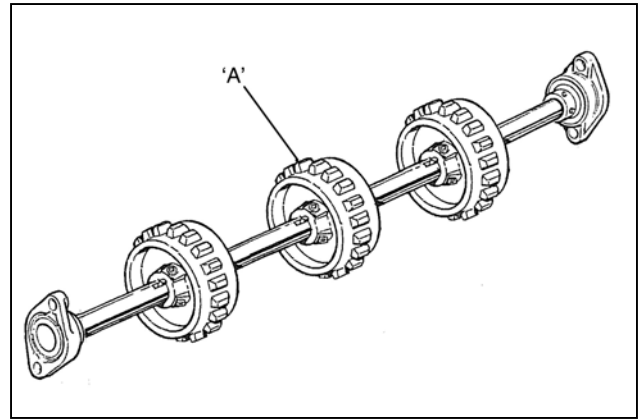
Replace the Sprocket Teeth when they become Worn. Worn teeth can cause serious damage to the Mat.

Mintex Mat. Adjust Length

- The Mintex Mat will 'stretch' during use. To prevent it from 'jumping' over the Sprocket Teeth it can be shortened by re-positioning the removable Mat Connector 'D'. The Mat Connector is secured with two nuts 'E'.

The two lower Idler Shaft Assemblies have 'Rubber and Steel' Rollers 'F' that run on Sealed Bearings. Set Screws hold the Bearings in place on the Shaft.

The Front Lower Idler Shaft has four Sprockets. The outer Sprockets are keyed to the Shaft and locked with Set Screws. See 'A' above. The two inner Sprockets rotate freely on the Shaft and are held in place with Lock Collars. See 'B' above. The Front Lower Idler Shaft is aligned with Adjusting Wedges. The adjustment procedure is the same as that on the Rubber Mat. See page 4-13.



MAINTENANCE

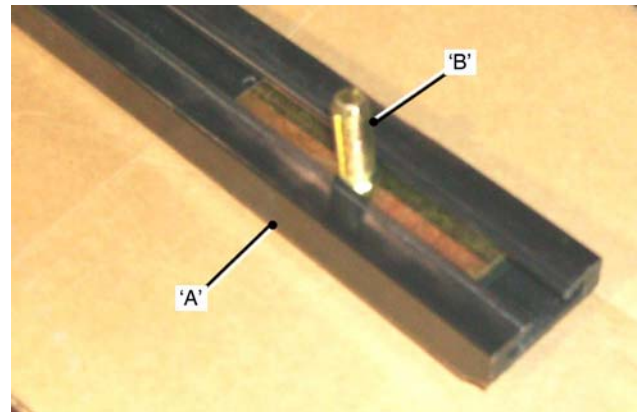
Conveyor Mat Sliders. Rubber Mat.

The Conveyor Sliders 'A' are made from UHMW Polyethylene that does not require lubrication. Their service life will vary, depending up on the soil conditions.

At each major service check the Sliders for excessive wear, particularly under the Roll-up Tray.

Each Slider is held in place with three T-Bolts 'B' and, at the bottom end, a Flat-head Socket Cap Screw 'C'. Excessive wear will be evident when the T-Bolts show through the Slider.

The wear thickness, (**3/8 inch**), is less than the over-all thickness.



Remove/Replace Slides.

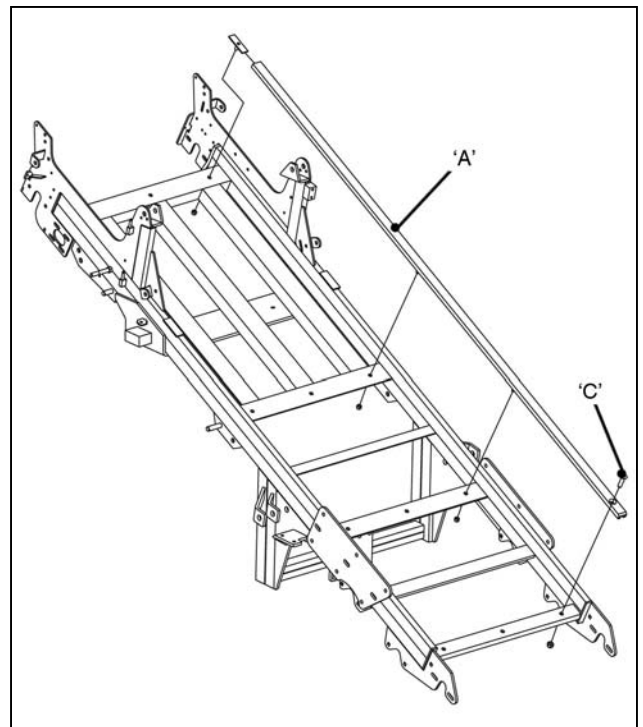
- Release the tension on the Mat Idlers. (See page 4-11), to allow the Mat to be raised up to provide access to the Sliders and Lock-nuts.
- Remove the four Lock-nuts that hold the Slider in place and remove it from the Frame.

When installing new Sliders, allowance must be made for expansion and contraction due to temperature changes. Do not fully tighten the T-Bolts, they should be 'snug' tight. To prevent damage to the Sliders the Flat-head Screws must not be tightened too much.

NOTE

It is recommended that if one slider is worn, both should be replaced.

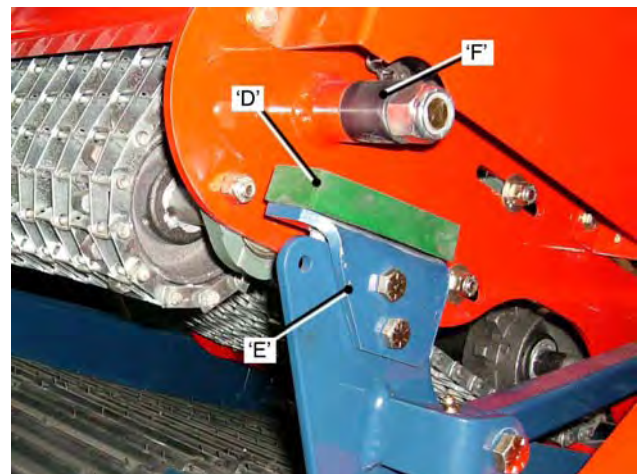
The 24 inch machine has three Sliders. To prevent the possibility of 'tapered' Rolls, replace all three.



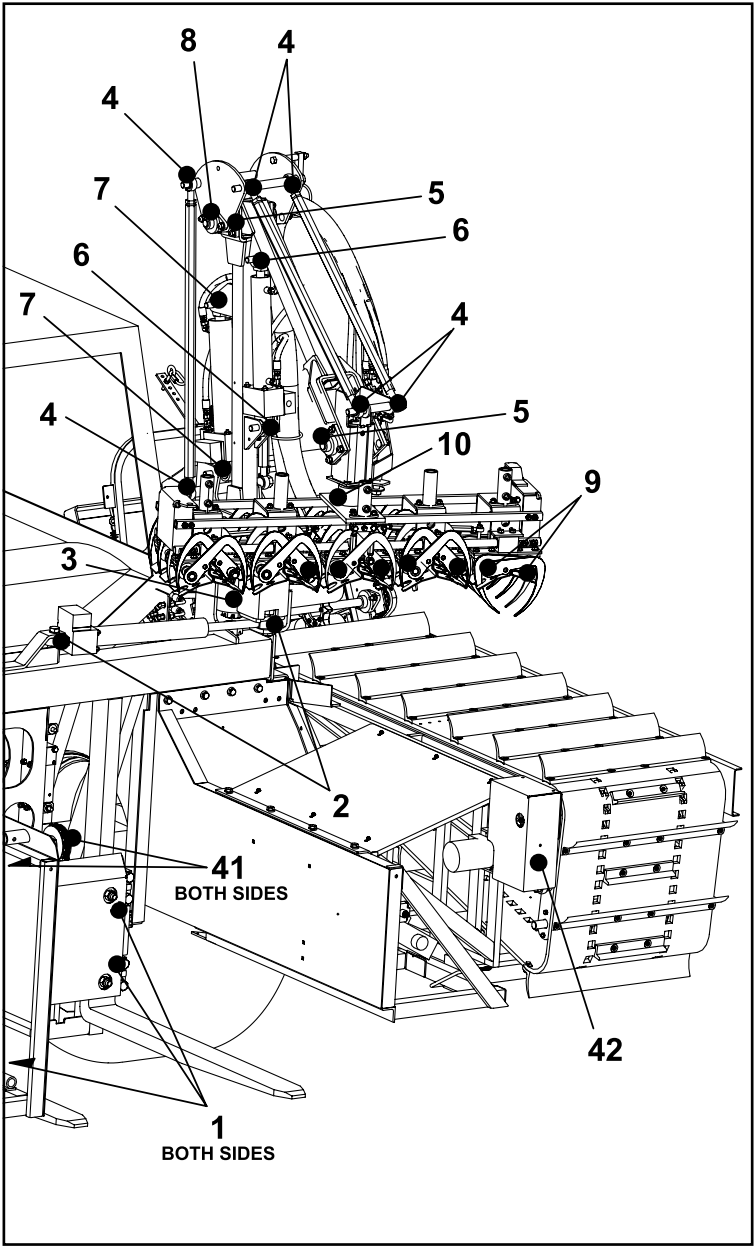
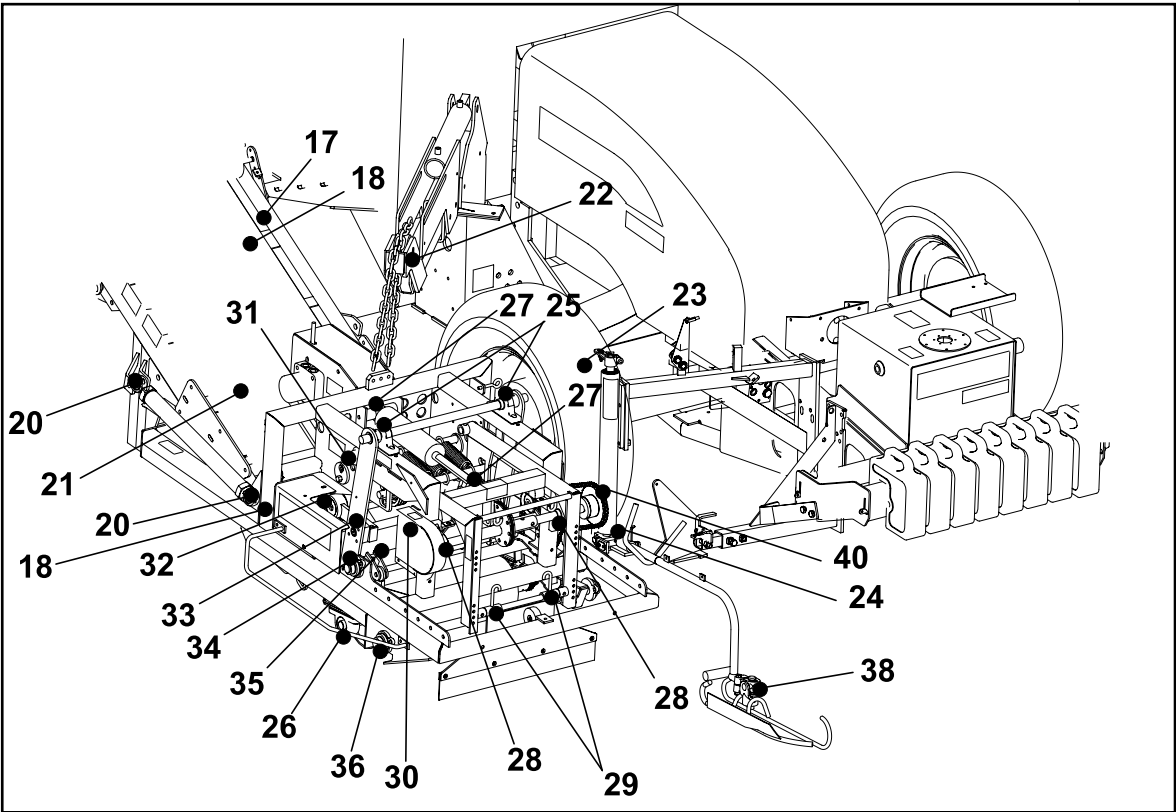
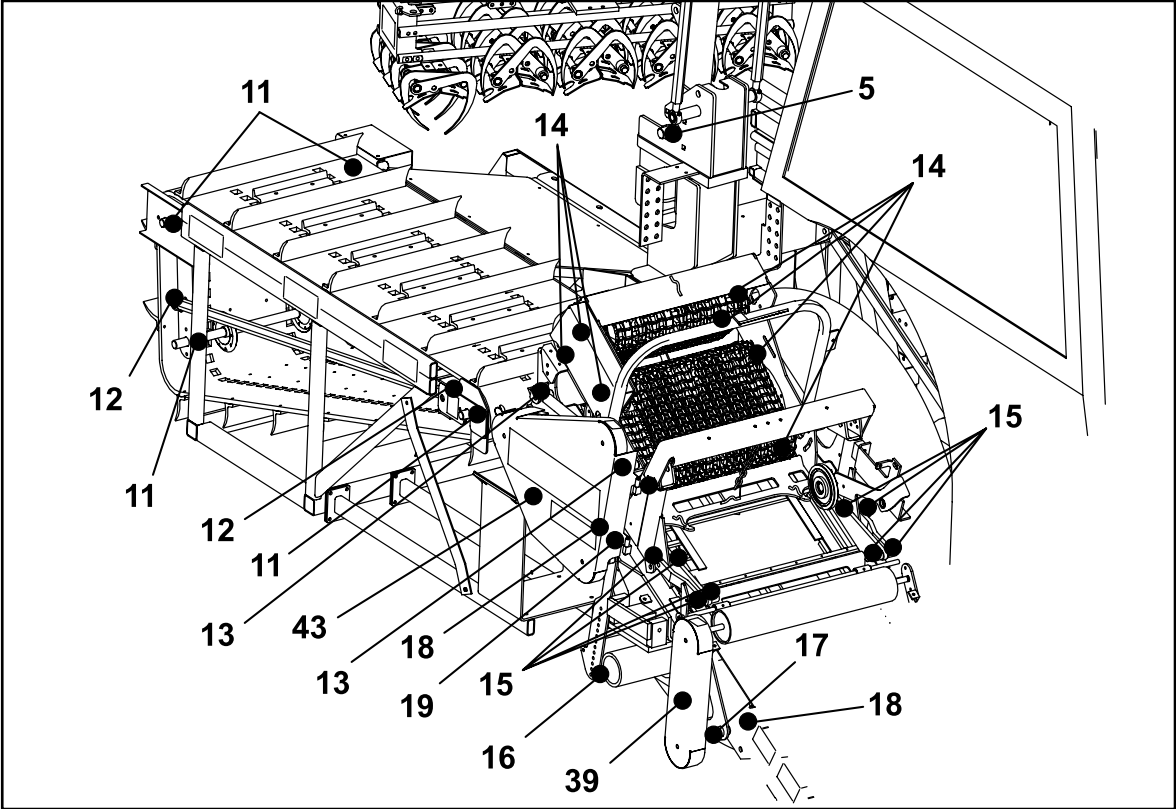
Roll-up Conveyor Stops.

The Roll-up Conveyor is a Mintex Metal one. See page 4-14 for details on the Mintex Mat.

- Roll-up Conveyor Stops 'D', are attached to Brackets 'E', on both sides of the Frame.
- Bushings 'F' are attached to both sides of the Roll-up Frame.
- Replace the Conveyor Stops and Bushings if badly worn or damaged.



This page left blank.



LUBRICATION POINTS					
REF.	LOCATION	QUANTITY	ACTION	DAILY	150 HOURS
1	PALLET LIFT ROLLER	4	GREASE	X	
2	ROBOTIC ARM ROTATION CYLINDER ENDS	2	GREASE		X
3	ROBOTIC ARM MAIN PIVOT	2	GREASE	X	
4	ROBOTIC ARM LINKAGE ROD ENDS	8	GREASE	X	
5	ROBOTIC ARM LIFT AND REACH ARM BEARINGS	6	GREASE		X
6	ROBOTIC ARM REACH ARM CYLINDER ENDS	2	GREASE	X	
7	ROBOTIC ARM LIFT ARM CYLINDER ENDS	2	GREASE	X	
8	ROBOTIC ARM LINKAGE PIVOT BEARINGS	2	GREASE	X	
9	GRIPPER HEAD PIVOT BEARINGS	20	GREASE		X
10	ROBOTIC ARM PIVOT HEAD	1	GREASE	X	
11	INDEX CONVEYOR SHAFT BEARINGS	6	GREASE		X
12	INDEX CONVEYOR LINKAGE ROD ENDS	4	GREASE	X	
13	ROLL UP TRAYPIVOTS	4	GREASE	X	
14	ROLL UP TRAYSHAFT BEARINGS	8	GREASE		X
15	STARTER TRAYLINK ARMS	8	GREASE	X	
16	MAIN CONVEYOR TENSIONING ARM BEARINGS	2	GREASE	X	
17	ROLLER ARMS4"	2	GREASE	X	
18	MAIN CONVEYOR SHAFT BEARINGS	8	GREASE		X
19	ROLL UP IDLER ARM	1	GREASE	X	
20	CUTTING HEAD LINK ARM ROD ENDS	4	GREASE	X	
21	CUTTING HEAD SWIVEL BALL	1	GREASE	X	
22	CONVEYOR LIFT ARM PULLEY	1	GREASE	X	
23	AUTOSTEER SELECTOR MOUNT	1	GREASE	X	
24	AUTOSTEER SHOE ARM PIVOT	1	GREASE	X	
25	CUTTING BLADE ARM SHAFT BEARINGS	2	GREASE		X
26	ROLLER BEARINGS8"	2	GREASE		X
27	CUTTING HEAD CYLINDER ROD ENDS	2	GREASE	X	
28	CAMHAFT BEARINGS	2	GREASE		X
29	CUT OFF BLADE PIVOT	2	GREASE	X	
30	RETURN CAM STOP PIVOT	1	GREASE	X	
31	CUT OFF FRAME PIVOT BEARINGS	2	GREASE		X
32	CONNECTING ROD	2	GREASE		X
33	WRIST SHAFT MOUNTING BLOCKS	2	GREASE	X	
34	DEPTH CRANK BEARINGS	2	GREASE		X
35	SCRAPER FRAME PIVOT	2	GREASE	X	
36	ROLLER SHAFT BEARINGS	2	GREASE		X
37	CRANKSHAFT BEARINGS	2	GREASE		X
38	AUTOSTEER SHOE PIVOT	1	GREASE		X
39	ROLLER CHAIN 4"	1	OIL	X	
40	CUT OFF BLADE DRIVE CHAIN	1	OIL	X	
41	PALLET LIFT CHAINS	2	OIL	X	
42	INDEX CONVEYOR DRIVE CHAIN	1	OIL	X	
43	MAIN CONVEYOR AND ROLL UP CHAINS	3	OIL	X	

SECTION 5

Adjustments.

Cut-Off Length	5-1
Cut-Off Sprocket Selection Chart	5-2
Cut-Off Cam, Return Cam, Return Cam Stop	5-2
Return Cam Stops Selection Chart	5-3
Index Conveyor	5-3
Roll End Sensor. Sensor Flag Setting	5-4
Cut-Off Blade Depth Adjustment	5-4
Spring Cam Eccentric Setting	5-4
Cut-Off Blade	5-5
Pitch Angle. Pitch Adjustment	5-5/5-6
Ground Roller. Scraper. Sod Guides	5-6
Roll-Up Conveyor. Roll-Up Sprockets	5-7
Roll Flap Stabilizer	5-7
Main Conveyor Alignment	5-8
Cutter Head Alignment	5-8
Pallet Lift Forks Sensors	5-9

Cut-Off Length Adjustment.



WARNING

The Safety Lift Lock **MUST** be in place when working on the Cutter Head in the raised position. Failure to observe this warning could result in Serious injury or death.



CAUTION

When changing Sprockets, to modify the Cut-Off length, the length of the chain may also have to be changed, particularly when changing from 'large' to 'small', or 'small' to 'large'. Incorrect chain length can result in the Idler Arm hitting the frame causing damage to the Cut-Off Cam.

NOTE

The 'standard' Cut-Off length is 54 inches. Rolls that are more than 10 inches in diameter will not fit on the Index Conveyor.

Refer to the Sprocket Selection Chart on the following page for available Sprocket Combinations.

To change Sprockets:

- Set the Depth of Cut Cylinder **fully retracted**. The Idler Arm Tension Springs 'A' will be under 'light' tension.
- Carefully press down on the Idler Arm 'B', and lift the Chain off the Idler Pulley 'C'.
- Remove the Chain from the Cam Sprocket 'D'.
- Back-off the Set Screw in the Cam Sprocket, (early units have Taper Lock Bushings), and remove it from the Cam Shaft.

If the sprocket combinations chosen make it necessary to change the Roller Sprocket:

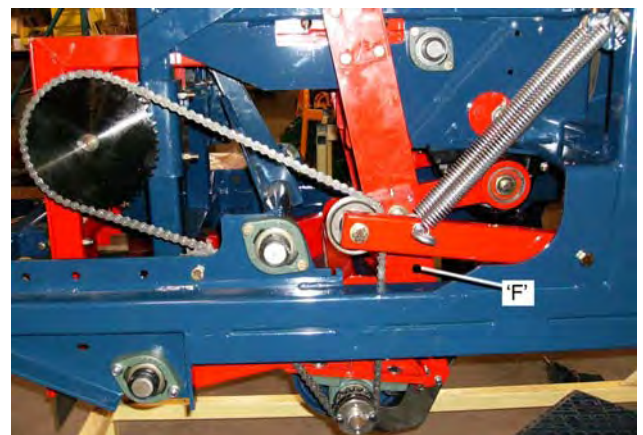
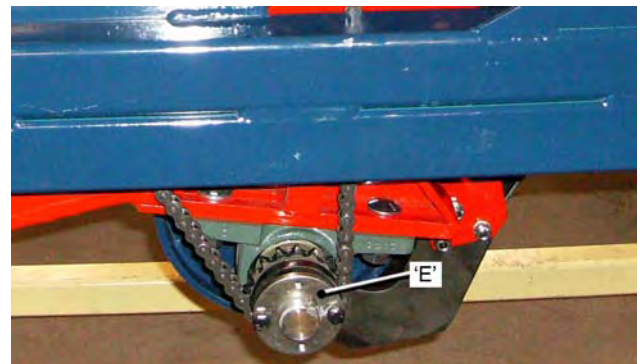
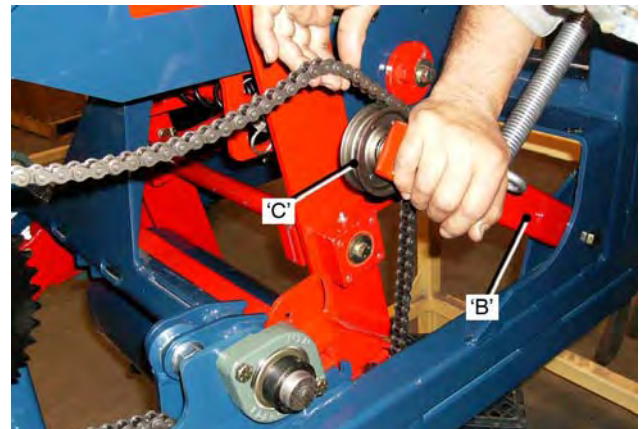
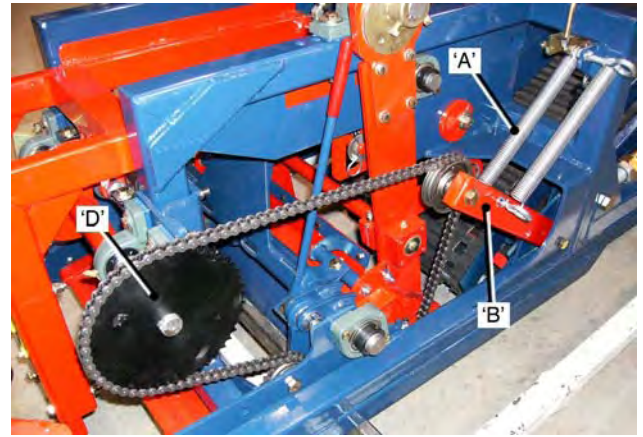
- Remove the Bolts from the Roller Sprocket Taper Lock Bushing 'E'. Fit the bolts into the threaded holes in the Taper Lock.
- Install the new Sprockets and refit the chain in the reverse order to above.
- To ensure that the Chain 'runs straight' on the Sprockets and Idler Pulley, visually check that they are in alignment.

IMPORTANT

When making changes from 'large' Sprockets to 'small', or 'small' to 'large', it may be necessary to adjust the length of the chain, adding/subtracting Links as required.

When fitting the Roller Sprocket, check that it is pushed far enough onto the Roller Shaft to ensure that the Taper Lock Bushing Bolts do not hit against the frame.

Before operating the machine, it is important to check that there is a minimum 1 ½ inches clearance between the Idler Arm and the Frame 'F', with the Depth of Cut Cylinder fully extended.



ADJUSTMENTS

Cut-Off Length.

Sprocket Selection Chart.

The Sprocket Combinations that are recommended, for various lengths of sod, are approximations. The final choice of Sprockets will best be determined by 'field trial'.

In the spring, when sod tends to be 'wet', it 'stretches' as it is cut. In drier conditions the cut length tends to be closer to the ground cut-off length.

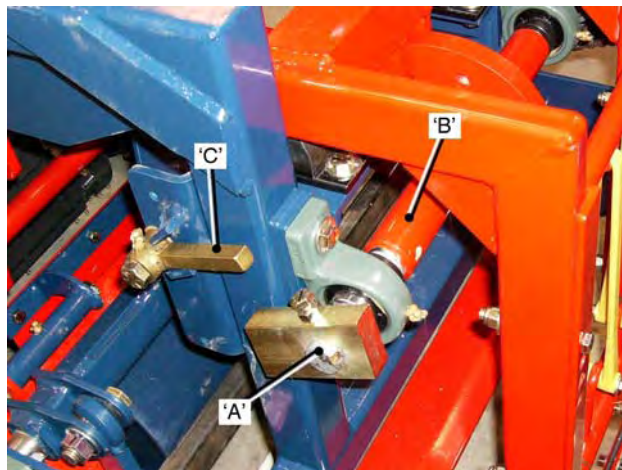
The type of grass, age of the sod, and the type of soil will also affect the length of the sod after it is cut.

SPROCKET SELECTION CHART		
CUT-OFF-LENGTH (inches) (metric)	54" 137cm	60" 152cm
Roller Sprocket	D1404 18T	D1404 18T
Roller Bushing Roller Key	For machines with 24 in. cutter head, use 83-H20 Use 124422 for all units.	
Camshaft Sprocket	D1423 36T	D1435 50T
Camshaft Bushing	83-P116 83-P118	83-P116
Camshaft Key	Use G8019 for ALL units.	
Stop Return Cam 24"	001789	

Cut-Off Cam. Return Cam and Return Cam Stop.

As the sod 'length' is cut to before the Cutting Blade has completed its cut under the full length, a Return Cam 'A', fitted on the 'outer' end of the Cut-Off Camshaft 'B', and Return Cam Stop 'C', fitted on the Frame, ensure a uniform cut length of the first piece of sod.

When the Return Cam 'A' reaches the correct position, it is engaged by the Return Cam Stop 'C'. This indicates the end of the cut, and prevents the spring pressure on the Cut-Off Frame from rotating the Cut-Off Camshaft 'backwards'.



Return Cam Stop.

A different Return Cam Stop is required for each length of cut.

The identifying Part Number is stamped into each one.

Refer to the chart for the Part Numbers.

Cut-Off Cams.

NOTE

There are three Cut-Off Cams available:

Slow Lift – For Cut lengths **under 54 inches.**

Stamped with the **letter 'S'**.

Fast Lift – For Cut lengths **54 inches to 72 inches.**

Stamped with the **letter 'F'**. This is the **'Standard'** Cam for Robomax.

Super Lift – For lengths **greater than 72 inches.**

Stamped with the **letters 'FF'**.

Index Conveyor.

The fore and aft position of the Index Conveyor Roll 'Cleats', relative to the Main Conveyor, is adjustable. This determines the location of the Roll Cleats, and ensures that the Rolls drop onto the Index Conveyor **'between'** the Roll Cleats.

Adjustment is made by repositioning the Sensor Flag relative to the Sensor.

IMPORTANT

When adjusting the Sensor Flag:

Start with it 'centered' on the Sensor, then rotate it in small increments to obtain the correct setting.

To adjust the Conveyor position:

- Pull back the Rubber Cover **'A'**.
- Loosen Set Screw **'B'**, in the Sensor Flag Boss.
- Rotate the Sensor Flag **'C'** **'clockwise'** to move the Conveyor Cleats **'forwards'**.
- Rotate the Sensor Flag **'counterclockwise'** to move the Conveyor Cleats **'rearwards'**.

Index Conveyor Mat – Tension.

Tension is maintained on the Conveyor Mat by the Side Link Arms **'D'**.

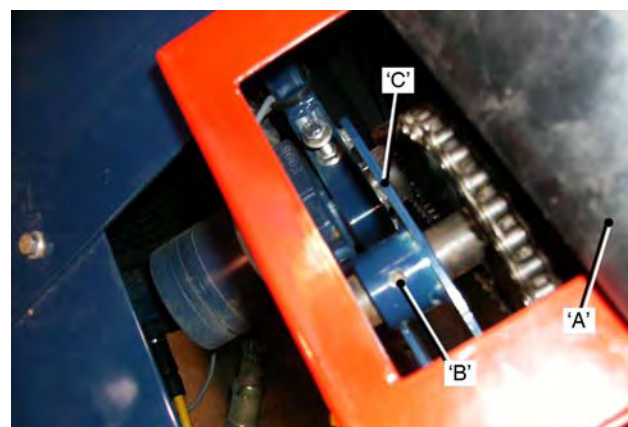
As the Index Conveyor goes from its normal operating position to the 'eject' position, the Link Arms **'D'** 'push' back against the Idler Tension Arms **'E'**, taking the slack out of the Conveyor Mat.

To increase the Mat tension:

- Loosen the Locknuts **'F'** at each end of the Arms.
- Turn the Link Arms 'clockwise' to extend them.
- They **must be adjusted equally**, to keep the Idler Shaft parallel to the Conveyor Drive Shaft.
- Re-tighten the Lock-nuts.

Return Cam Stops.	
Part No.	Cut Length.(inches).
001794	18.0
001793	24.0
001792	36.0
001791	40.5
016619	45.0
001790	*48.0/48.4
016618	51.6
014645	54.0
001788	60.0
001802	64.6
001801	68.9
001787	*72.0/72.8
001799	77.6
001376	*80.0/81.0
001800	85.8
015553	90.0
014974	*96.9/98.0

NOTE: * - Indicates length change depending on the **Sprockets** Fitted.



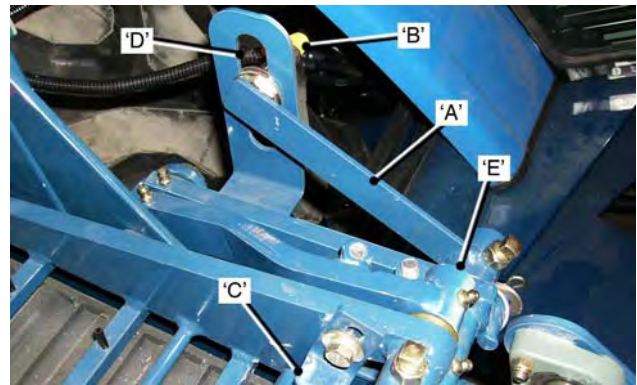
ADJUSTMENTS

Roll End Sensor.

The Roll End sequence starts with the Sensor Flag 'A' directly in line with the Sensor 'B', before the leading edge of the sod has reached the Starter Gate 'C'. The Roll End Sensor LED on the Cab Control Panel will indicate 'ON'.

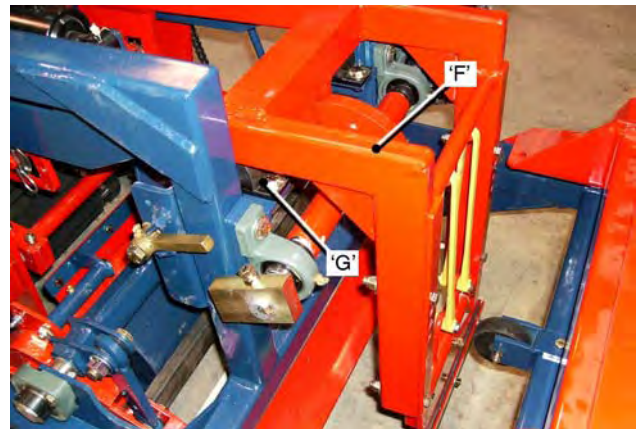
As the Sod passes into the Starter Gate 'C' the Sensor 'Flag' will rotate away from the Sensor 'B' and the LED will indicate 'OFF'.

The LED will continue to indicate 'OFF' until the trailing edge of the sod has passed the Starter Gate. At this point the Sensor Flag will rotate 'back', to be in line with the Sensor, and the LED will indicate 'ON'.



Sensor and Sensor 'Flag' Setting.

- Position the Sensor 'B' in the center of the Slot 'D'. Do not fully tighten the Locknuts.
- Loosen the Set Screw 'E', position the Sensor Flag directly in line with the face of the Sensor and re-tighten the Set Screw.
- Loosen the Locknuts on the Sensor Body. Adjust the Locknuts until the face of the Sensor is 1 to 3mm from the Sensor 'Flag'. Tighten the Locknuts.



Cut-Off Blade, Depth Adjustment.

The Cut-Off Blade must be kept sharp. The Depth of Cut should be just deep enough to ensure a clean cut.

The Cut-Off Frame 'F' should make only 'light' contact with the Rubber Stops 'G'.

The Spring Shaft 'H' is located in the center position at the factory, normally this provides correct spring pressure. Moving the Spring Shaft to the 'upper' position **reduces** the spring pressure.

Moving the Spring Shaft to the 'lower' position **increases** the spring pressure.



To change the Spring Shaft Setting:

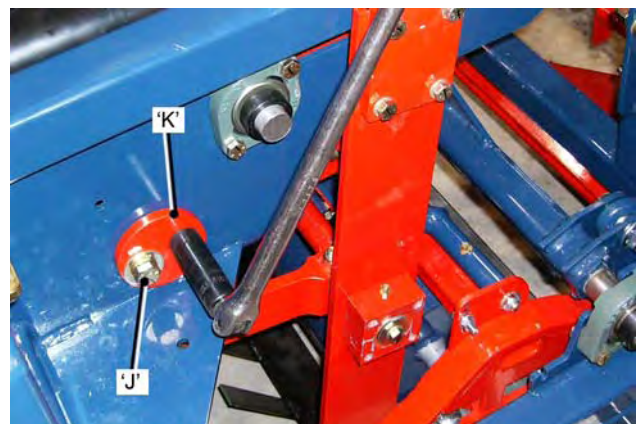


WARNING

Exercise care when releasing the Spring Cam. Use a Ratchet with a long handle. This will allow the Spring Cam to turn past center. Failure to observe this warning could result in personal injury.

To release the Spring Tension:

- Loosen the Lock-bolts 'J'.
- Turn the Spring Cams Eccentric 'K' 'clockwise'.
- Move the Spring Shaft to the desired position.
- Reset the Spring Tension by turning the Spring Cam Eccentric 'counterclockwise' until it 'clicks' over-center..
- Tighten the Lock-bolts 'J'.



Cut-Off Blade

If the Cut-Off Blade 'A' does not cut 'completely' through the sod when the Spring Shaft is in the desired location, reposition the Cut-Off Blade Frame 'B' one hole lower on the Cut-Off Frame 'C'.

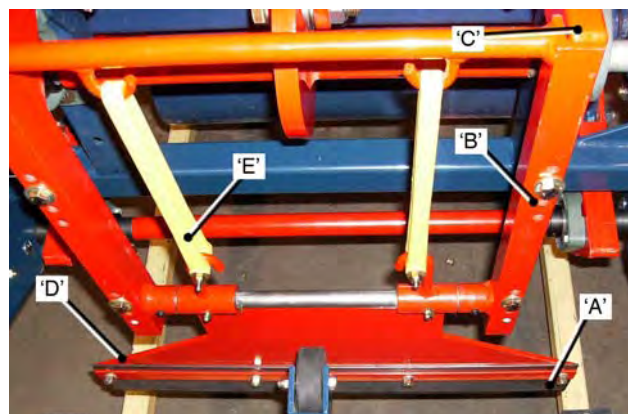
The Cut-Off Blade depth is reduced over time by wear, and by sharpening. If a blade is less than 2 ½ inches in depth, it must be replaced.

Check that the edge of the Cut-Off Blade Mount 'D' does not hit the sod, on the 'down' stroke, as this will damage the sod and cause problems when the sod is 'laid'.

NOTE

A Serrated Blade is available for use in soft soil, or excessive thatch. This Blade will give a cleaner more positive cut.

The Urethane Tension Straps 'E', allow the Blade to 'swing' with the forward travel of the machine as the cut is made. When the machine is stationary the Blade should hang in the vertical position. Any Change to the shape, or position, of the Tension Straps attaching hooks, will change the angle of the blade.



Pitch Angle

Pitch Angle is the angle that the Cutter Blade makes relative to the ground. The Pitch Angle is set at the factory for average cutting conditions.

Pitch Angle can be adjusted to improve cutting performance in soft or hard soils.

In soft conditions the Pitch Angle should be set so that the Cutting Blade is almost 'parallel' to the ground.

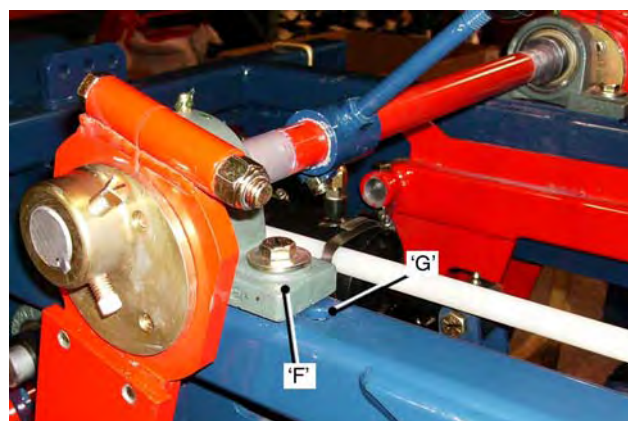
In hard soil the Blade Angle should be increased, this maintains the correct cutting angle, and also prevents the Cutting Head from coming out of the ground.

IMPORTANT

When the Pitch Angle is changed, the relationship of the Cutting Blade to the Conveyor Mat, and also the Ground Roller, **must be maintained**.

The Front Idler Shaft of the Conveyor Mat can be adjusted to ensure that there is no interference between the Mat and the Blade.

Refer to the Ground Roller adjustment instructions for the correct Roller to Blade set-up.



Pitch Adjustment.

At the factory the Bearings 'F' are located in the 'center' set of holes in the frame, this is the 'normal' setting.

- Move the bearings to the front holes 'G', (maximum pitch), for hard soil.
- Or, move the bearings to the rear holes, (minimum pitch) for soft soil.

For 'fine adjustment' of the Blade Pitch, see page 5-6.

ADJUSTMENTS

Pitch Angle – Fine Adjustment.

On the left and right hand sides:

- Loosen the Eccentrics Clamps Locknuts 'A'.
- Turn the Adjustment Handle 'B' to rotate the Eccentric Adjusters 'C' to obtain the required amount of pitch angle.
- Re-tighten the Locknuts.

Roller Adjustment.

The Ground Roller 'D' supports the front of the Harvester Conveyor. It also applies pressure to the sod ahead of the Cutter Blade 'E'.

The Roller position can be adjusted 'forward' or 'back' on the Cutter Head Frame, it must be positioned with the vertical centerline of the Roller is 2 ½ inches ahead of the Cutter Blade, when the Blade is at its maximum forward stroke.

The Roller and Blade **must be parallel** to each other, to avoid 'tapered' rolls.

The Roller must be 'centered' between the Cutter Side Arms, to prevent the attaching bolts 'F' from fouling against the Roller.

In 'Peat' or 'Muck' soil conditions the 2 ½ inch dimension, from Roller Center to Blade, may need to be reduced to maintain the proper cutting action.

In 'soft soils' or 'excessive thatch', 'rolling' the area to be cut, before harvesting, will result in easier cutting and a better quality, tighter roll.

In 'stoney ground' conditions it is advisable to move the Roller 'forward', to allow small stones to pass between the Blade and the Roller. The increase in clearance can be up to 2 or 2 ¼ inches. Insufficient clearance from Roller to Blade, causes a 'pinching action', resulting in pieces of sod that are longer than required

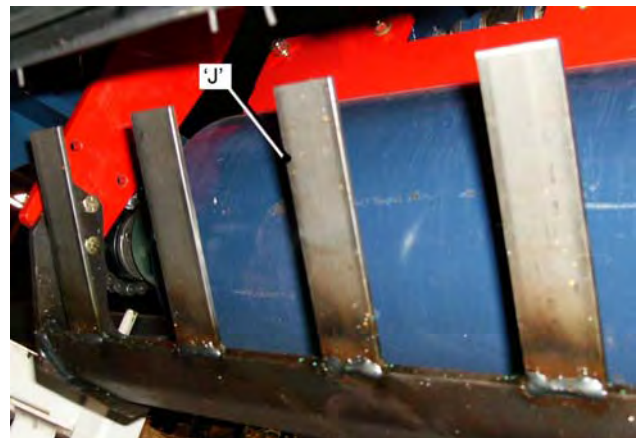
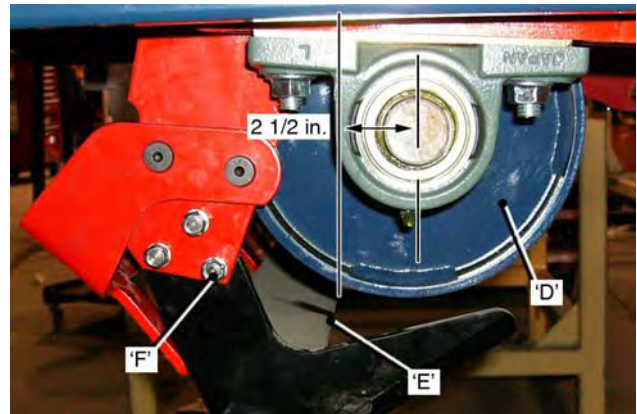
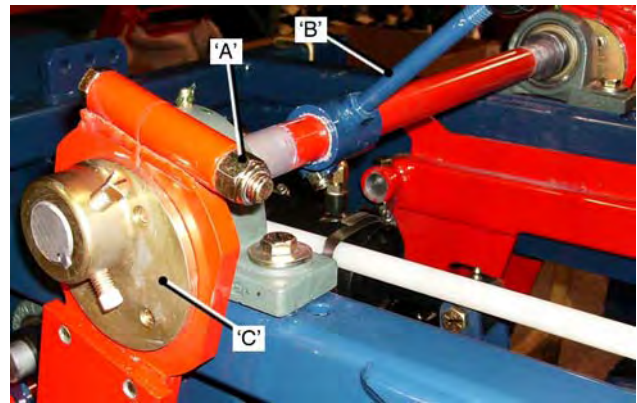
Ground Roller Scraper.

The cut length of the sod is measured by the rotation of the Ground Roller 'D'. The Roller must be kept clean. The build-up of grass, mud or dirt, on the Roller, can increase its diameter, resulting in an increase to the length of cut.

The Roller Scraper 'G' prevents this build-up. Adjustment is provided by 'slotted' holes. Loosen the fasteners 'H' and pivot the Scraper until it is 'just' clear, (1/32in.), of the face of the Roller.

Sod Guides.

The Sod Guide 'fingers' 'J' direct the sod from the Cutter Blade to the Conveyor. Check that they line-up with the Conveyor Mat, and do not hit against it when operating. If any Fingers that get 'bent' must be straightened before operating the machine.



Roll-Up Conveyor.

The Roll-Up Tray Hanger Chain 'A', should be set so that the clearance between the Roll-Up Tray 'B', and the Starter Tray 'C', is **no less than 2 to 2 ½ inches**.

Roll-Up Sprockets.

The Roll-Up Conveyor 'D' completes the roll-up after the sod has passed the Starter Tray. The speed of the Roll-Up is determined by the Sprocket Combinations fitted at the factory. The factory settings are for average operating speed, for a specified cut length of sod.

The Roll-Up is chain driven by Sprocket 'E' on the Main Conveyor Sprocket Shaft, to Roll-Up Drive Sprocket 'F'. Chain tension is controlled by the Idler Pulley 'G'. Sprockets can be changed to suit operator requirements.

Refer to the Sprocket Chart for alternate Sprockets.

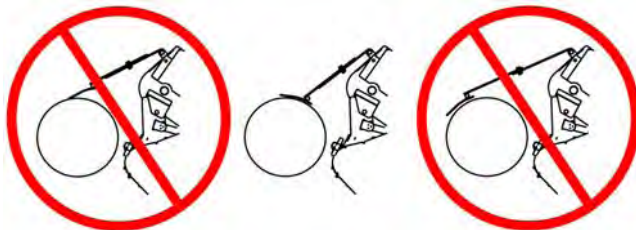
The Mat Front Idler Assembly must be set so that Mat is 'just clear' of the front cross-member. This prevents the sod from getting 'jammed' and disrupting the operation.

The Rear Idler Assembly adjusts the 'upper' Mintex Mat to allow enough slack, so that the mat can be pressed down 1 ½ inches, between the front and rear sprockets.

When adjusting the shafts to tension the mats, the front and rear shafts must be parallel, to prevent 'conical' rolls.

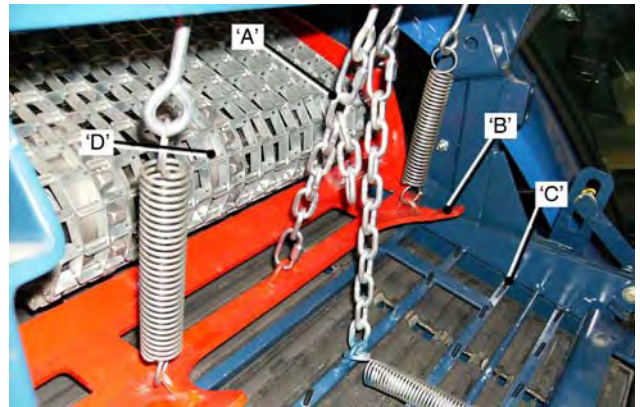
Roll Flap Stabilizer.

The Roll Flap Stabilizer 'H', must be adjusted so that it is positioned on the sod roll as shown below.



Adjust as follows:

- Loosen the Locknuts 'J'.
 - Slide the Roll Flap Stabilizer 'up' or 'down' to match the size of the rolls.
- Tighten the Locknuts.



Roll-up Sprockets.	
Roll-Up Drive.	
16 inch Machine.	
Drive Sprocket	23T. (Supply 19T & 27T)
Driven Sprocket	33T. (Supply 36T)
24 inch Machine.	
Drive Sprocket	16T. (Supply 12T).
Driven Sprocket	36T.
Vertical Drive Sprockets.	
Drive Sprocket	12T.
Driven Sprocket	24T.



ADJUSTMENTS

Main Conveyor. Tracking Alignment.



WARNING

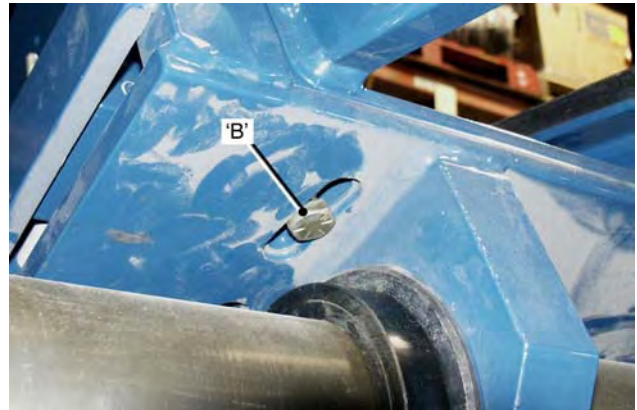
Do not make any adjustments when the tractor engine is running. Failure to observe this warning could result in serious injury or death

IMPORTANT

The Main Conveyor must be aligned parallel to the tractor.

NOTE

For clarity the photographs show the Conveyor Pivot Beam during assembly.



To adjust the Conveyor Alignment:

- Back-off the Locknuts 'A', until they are just 'snug', (approximately two turns).
- The bolt heads are located in 'T-Slots' 'B'.
- Loosen Locknuts 'C', on the Adjusting Bolts 'D'.
- Adjust the Bolts to move the Block 'E', to the 'front' or to the 'rear', until the Conveyor Frame is parallel to the tractor, when viewed from in front of the harvester.
- Fully tighten Locknuts 'A' and 'C' when the adjustment is completed.

Cutter Head. Tracking Alignment.

The Cutter Head must track in-line with the Main Conveyor, to ensure that the sod is not cut at an angle, resulting in cone shaped rolls.

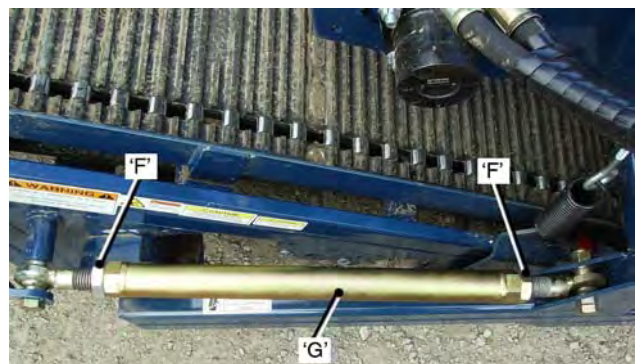
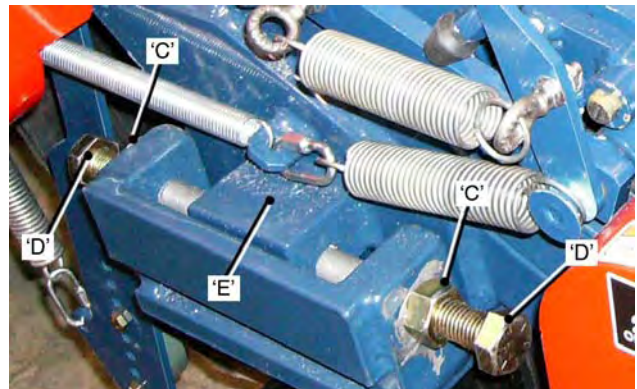
To adjust the Cutter Head alignment:

- Loosen the Rod End Locknuts 'F' on the Side Arm Links 'G', on both sides of the Cutter Head.

NOTE

The Rod Ends are a Left Hand Thread and a Right Hand Thread.

- Turn the Side Arm Links on each side to extend, or contract, until the Cutter Head Frame is parallel to the Conveyor Frame.
- Re-tighten the Rod End Locknuts.



Pallet Lift Forks

The Pallet Lift Forks are controlled by the Computer to move 'down' from the 'upper' position, where two layers of sod are placed on the pallet, to the 'middle' position where one more layer is placed, then to the 'lower' where the remaining layers are stacked.

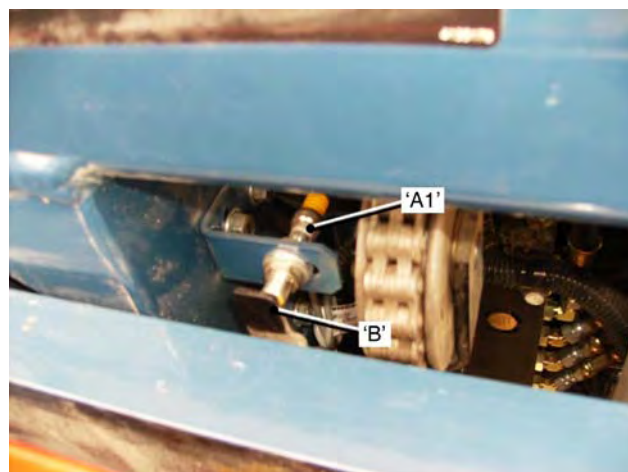
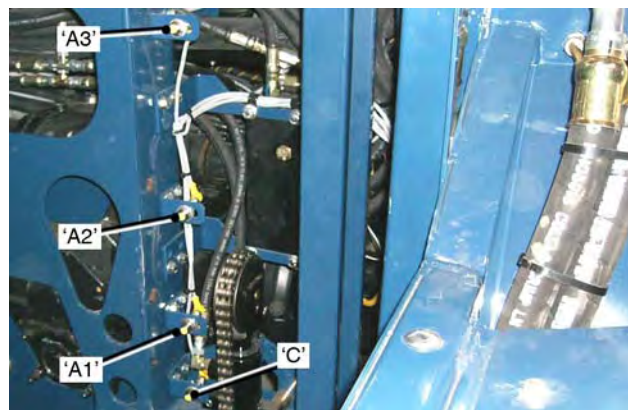
- When the last layer is stacked, '**FULL PALLET**' is displayed on the Cab Control Panel Screen.
- The operator presses the '**UNLOAD PALLET**' Pad, to lower the Pallet to the ground, as the harvester continues to move forward.
- An empty pallet is 'injected' (this is detected by Proximity Sensor '**C**'), and the operator presses the '**EMPTY PALLET**' Pad to return the empty pallet to the 'upper' position, ready to start a new operating cycle.

Pallet Lift Forks Sensors.

The Proximity Sensors '**A1** – Upper', '**A2** – Middle' and '**A3** – Lower' must be adjusted so that the face of the Sensor is 1 to 3mm. from the Pallet Lift Sensor Flag '**B**'.

To adjust the Sensor Flag:

- Switch the Robomax System to '**ON**'
- Raise the Lift Forks to the highest position.
- Loosen the two bolts in the Sensor Flag.
- Slowly move the Sensor Flag '**DOWN**' until the **LED** on the Control Panel indicates '**OFF**'.
- Slowly move the Sensor Flag '**UP**' until the **LED** indicates '**ON**'.
- Re-tighten the Sensor Flag Bolts.



SECTION 6**AUTO-STEER****Set- Up and Operation.****CONTENTS**

Cutting 'Starting Strip'.	6-1
Cam Roller and Roller Arm Position	6-1/6-2
Fine Adjust Control	6-3
Shoe Arm Adjustment	6-3
Guide Shoe Adjustment	6-4
Re-Set Cylinder Chain Adjustment	6-4
'Stop Bolt' Adjustment	6-4
Tracking Adjustment	6-5
Sensitivity Adjustment	6-6

AUTO-STEER

Auto-Steer

Set-up and Operation.

When the **Auto-Steer** System has been initially Set-Up, and the machine is ready to commence harvesting, it is important before starting, that the Auto-Steer final set-up is carried out by following the instructions below.

Fig.6-01

A starting strip of turf must be cut 'manually steering', this creates the turf 'edge' for the Guide Shoe to follow.

- Start the tractor and set the engine at 1800 RPM. Engage 1st Gear, the tractor will move forward.
- Push the Cutter Head Control Lever 'forward', to lower the Cutter head.

Using **manual steering**, proceed to cut the starting strip. The starting strip **must be cut straight**, to ensure the **correct operation of the Auto-Steer**.

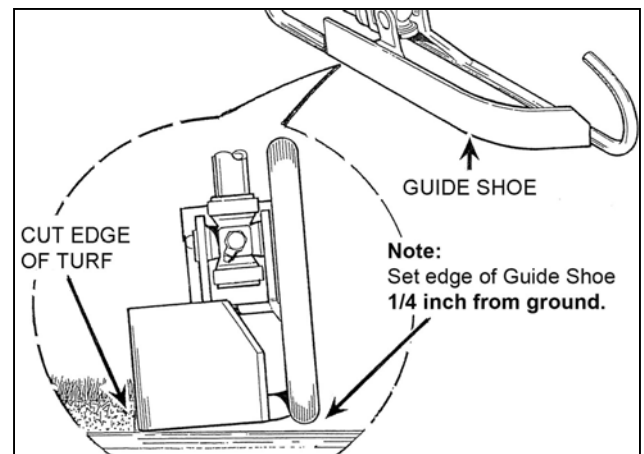


Fig.6-01

Fig.6-02

When the starting strip has been cut :

- Position the harvester parallel to the start strip, with the Cutter Side Blade aligned to the 'cut edge' of the turf.
- Switch the Auto-Steer '**ON**', with Rocker Switch '**A**' on the Control Panel.

NOTE

If the Guide Shoe lowers on the '**un-cut**' turf, when the Auto-Steer is switched '**ON**', switch the Auto-Steer '**OFF**'. The reset cylinder will move the Guide Shoe 'off' the un-cut turf, then switch the Auto-Steer back '**ON**'.

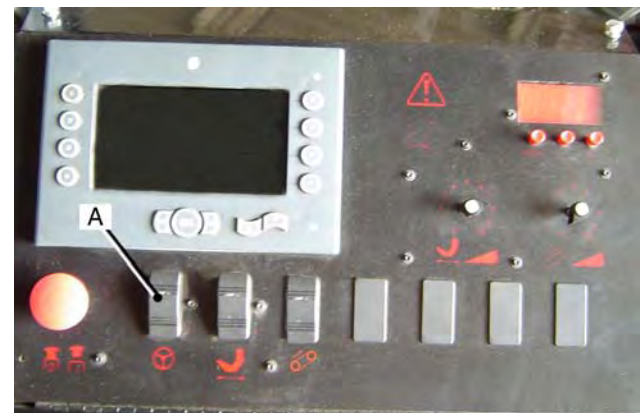


Fig.6-02

Fig.6-03

- Select 1st Gear.
- Lower the Cutting Head.
- Continue cutting the second strip, use the 'Fine Adjust' Control to trim any waste. Each revolution of the Control knob will give approximately 1/4 inch of lateral movement of the Guide Shoe.

If the Auto-Steer works satisfactory but the 'Fine Adjust' Control Cable has run out of adjustment, re-set the cable

NOTE

If there is a problem with the Auto-Steer during harvesting, re-set the Auto-Steer in the following sequence

Cam Roller and Roller Arm Position.

IMPORTANT

The Cam, Roller and Stop Pin **must be set-up** with the Stop Pin at the '**mid-point**' of its travel, in the cavity in the Sensor Valve End Plate. This is the '**NEUTRAL**' position in the Sensor Valve.



Fig.6-03

Continued on the following page.

AUTO-STEER

Cam and Roller Arm Set-Up.

The recommended method of setting the Auto-Steer is:

- Position the Harvester 'ready to cut'.
- With the Auto-Steer '**OFF**', cut a strip of turf, for a minimum distance of 20 feet. **It must be cut straight.**
- Stop the harvester.

The harvester will be parallel to the cut edge, the steering wheels 'straight ahead', and the cutter head 'down'.

Switch the Auto-Steer 'ON'. Turn the Tractor 'OFF'.

Fig.6-04

- Remove the two 5x40mm Socket Head Screws from the Sensor Valve End Plate '**A**' and remove the End Plate Cover '**B**', complete with Rubber Seal.

Fig.6-05

- Swing the Auto-Steer Guide Shoe 'left or right', to align the $\frac{1}{4}$ inch hole in the Cam with the hole in the Support Plate.
- Insert a $\frac{1}{4}$ inch Bolt '**C**', through the holes to lock the Cam in position.
- Adjust the Cable '**D**' (attached to the Cam), to the 'mid-point' of its stroke travel, and lock it in place. (see Fig.6-04)

Fig.6-06

- Back-off the Setscrew that clamps the Roller Arm to the Roller Shaft, (See Fig.6-07).
- Use a 'flat blade' screwdriver to turn the Stop Pin to its '**mid-point**' of travel in the cavity. Hold the Stop Pin in this position.
- The Sensor Valve Internal Spool will now be in the '**NEUTRAL**' position.

Fig.6-07

- Push the Roller Arm until the Roller is 'hard' against the Cam.
- Adjust the Roller Arm 'up or down' on the shaft, to get maximum surface contact between the Roller and the Cam.
- Check that the Roller Arm is fully engaged on the knurled portion of the Roller Shaft.
- Tighten the Roller Arm Setscrew.

IMPORTANT

Before operating the Auto-Steer **remove the $\frac{1}{4}$ inch Bolt from the Cam**. Failure to do so will result in damage to the system.

Also

Fill the cavity around the Stop Pin with 'white grease' to prevent corrosion forming on the Roller Shaft, causing it to 'stick' and adversely affecting the operation of the Auto-Steer

Position the Sensor Valve End Plate Cover, complete with the rubber seal, re-fit the 40mm Lg. Socket Head Screws. Replace the Top Cover Plate.

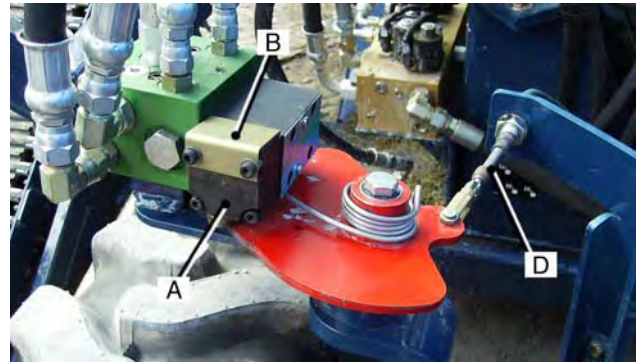


Fig.6-04

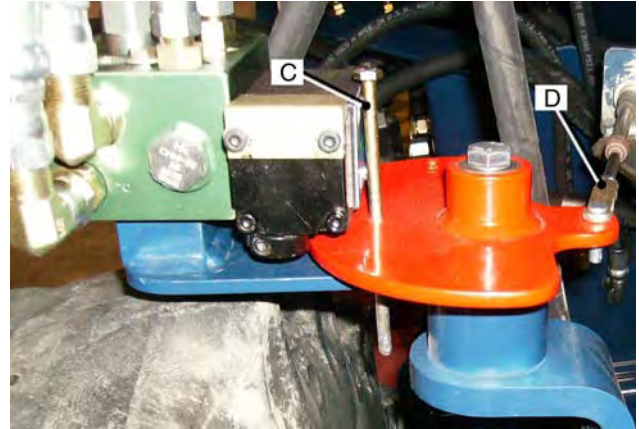


Fig.6-05

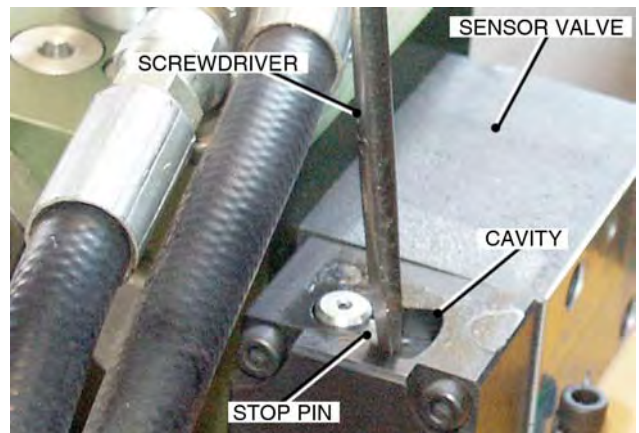


Fig.6-06

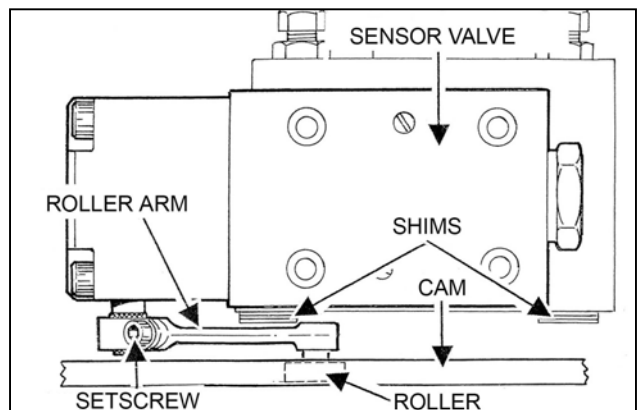


Fig.6-07

Fine Adjust Control.

As noted in Figure 6-03, the Fine Adjust Control allows the operator to trim the waste strip. It is recommended that it is set-up as follows:

Fig.6-08

Set the Fine Adjust Control to its 'Mid-Point' by:

- Releasing the Control Lock.
- Press the End Button, and slide the Control Knob 'IN' or 'OUT,' to find the mid-point of travel.
- Re-tighten the Control Lock.



Fig.6-08

Actuator Column.

Spring Tension Adjustment.



CAUTION

The Top Lever Arm is under spring tension. Exercise care when removing the Cable Clevis End from the Top Lever Arm, or when loosening the Lever Arm Clamp Bolt

Fig.6-09

Position the Guide Shoe against the cut edge of turf :

- Remove Clevis End 'A', from Top Lever Arm 'C'.
- Loosen the Shoe Arm Clamp Bolt 'B'.

The Top Lever Arm 'C', should rotate 'clockwise' approximately **60 degrees**, releasing the spring tension.

If the Lever Arm rotates 'back' **less than 60 degrees**, re-set it by :

- Loosening the Clamp Bolt 'D', and turning the Lever Arm to the required setting.
- Tighten the Clamp Bolt 'D'.
- Fit a 1¼ in. wrench on the Lever Arm Boss and rotate the Top Lever Arm 'back' **60 degrees, against the spring pressure.**
- Refit the Clevis End 'A'.



Fig.6-09

Shoe Arm Adjustment

Fig.6-10

The Guide Shoe Arm must be at a **75 to 80 degree** angle to the ground.

To adjust the Shoe Arm angle :

- Loosen the two Clamp Bolts in the Mounting Pivot.
- Tighten the Release Bolt to 'open up' the clamp and rotate the Shoe Arm to the correct angle.
- Back-off the Release Bolt and tighten the Clamp Bolts.

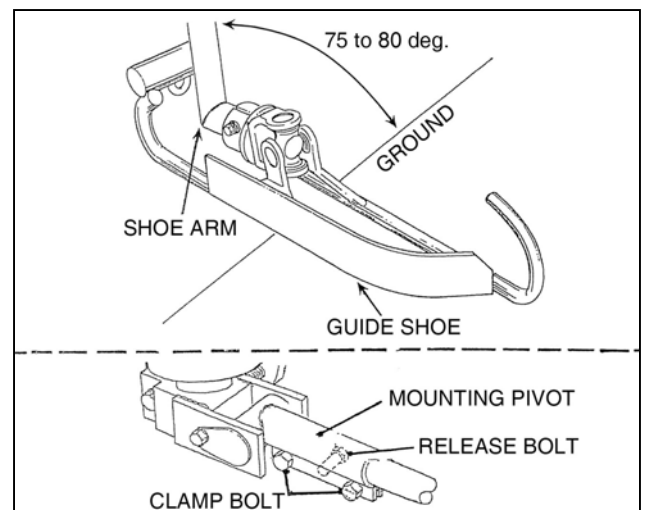


Fig.6-10

Guide Shoe Adjustment.

Fig.6-11

The Guide Shoe must be correctly adjusted, as follows :

- Loosen the Yoke Clamp Bolt and rotate the Guide Shoe until there is **1/4 inch** clearance between the **inside edge** of the shoe and the ground.
- Tighten the Yoke Clamp bolt.

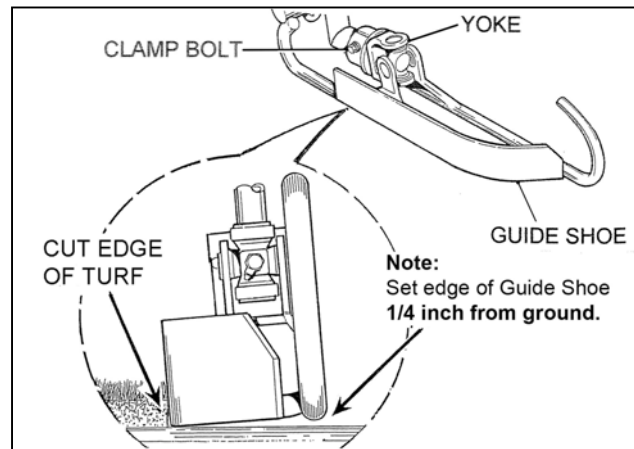


Fig.6-11

Re-set Cylinder Chain Adjustment.

Fig.6-12

The Re-set Cylinder must be attached to the chain links at a point that allows the Guide Shoe to travel no more than **2 inches past the 'cut edge'** and onto the un-cut turf.

IMPORTANT

The Re-set Cylinder chain links must be adjusted before the adjustment to the Stop Bolt. See Fig.6-13.

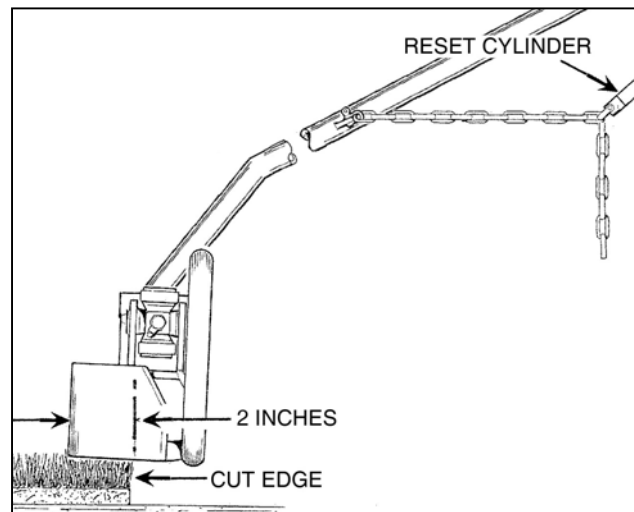


Fig.6-12

STOP BOLT ADJUSTMENT.

Fig.6-13

The Stop Bolt determines where the Guide Shoe will 'drop' on the **ground** when the Auto-Steer is activated. For most harvesting conditions the Stop Bolt is adjusted to place the Guide Shoe 1 to 2 inches from the '**cut edge**'

If the conditions require adjustment to the Guide Shoe :

'Away' from the cut edge :

- Back-off the Locknut and turn the Stop Bolt '**IN**'.

'Closer' to the cut edge :

- Turn the Stop bolt '**OUT**'.

After adjustment **tighten the Locknut**.



Fig.6-13

Tracking Adjustment.

The recommended method of setting the tracking is :

- Position the harvester 'ready to cut'.
- With the Auto-Steer switched '**OFF**,' cut a strip of turf, for a minimum distance of 20 feet, **it must be cut straight.**
- Stop the harvester.

The harvester will be parallel to the cut edge, the steering wheels 'straight ahead', and the cutter head down.

- Switch the Auto-Steer '**ON**', the Guide Shoe will drop.

Fig.6-14

To Set the Fine Adjust Control to '**Mid-Point**':

- Release the Fine Adjust Control 'lock' '**A**'.
- Press on the End Button '**B**', and slide the Control Knob Rod '**in or out**', to find its mid-point of travel.
- Re-tighten the Control 'lock'.

Fig.6-15

- Position the Guide Shoe against the cut edge of turf.
- Fit a 1¼ in wrench on the Top Lever Arm Boss '**C**'. Continue below

Fig.6-16

- Use the wrench on the Lever Arm to rotate the Cam until the ¼ inch hole in the Cam aligns with the hole in the Support Plate.
- Insert a ¼ in. Bolt '**D**', in the holes to lock the Cam in place.

The Sensor Valve will now be in the '**NEUTRAL**' position.

Fig.6-17

To prevent any movement of the Top Lever Arm and Spring Column Shaft, use the wrench to hold the Top Lever Arm firmly, against spring pressure and:

- Loosen the Shoe Arm Clamp Bolt '**E**', and move the Guide Shoe against the 'cut edge' of the turf.
- Tighten the Shoe Arm Clamp Bolt.

IMPORTANT

Before operating the Auto-Steer the ¼ in. bolt **must be removed** from the Cam. Failure to do so will result in damage to the Auto-Steer mechanism.

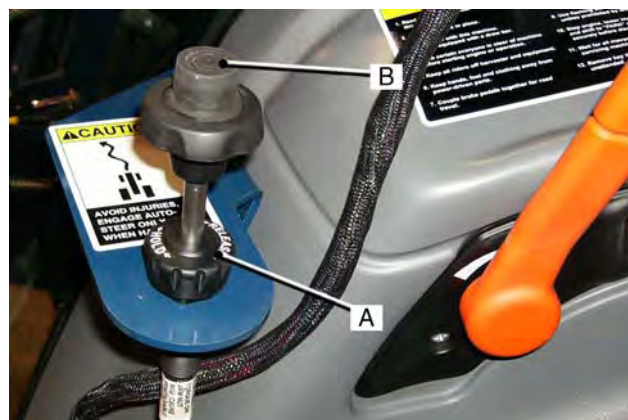


Fig.6-14



Fig.6-15

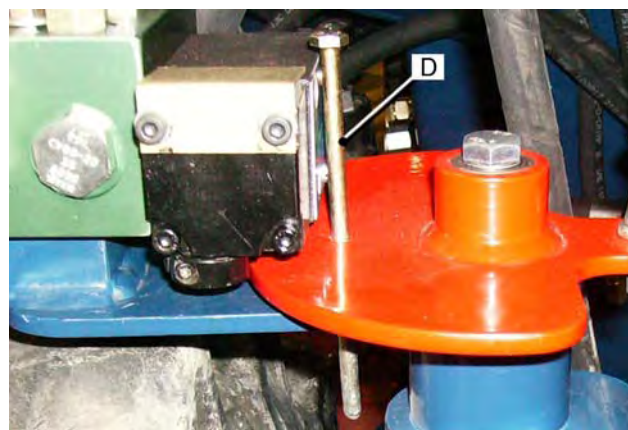


Fig.6-16



Fig.6-17

AUTO-STEER

Sensitivity Adjustment



CAUTION

The Top Lever Arm is under spring tension. Exercise care when removing the Cable Clevis End from the Top Lever Arm, or when loosening the Lever Arm Clamp Bolt

Fig.18

On initial set-up, the Cable End from the Sensitivity Valve is attached at the 'outer' hole, (maximum sensitivity), in the Top Lever Arm.

Operating conditions may require adjustment to the degree of sensitivity.

- To '**decrease**' sensitivity, move the Rod End Clevis progressively 'inward', on the Lever Arm, to obtain the desired setting.



Fig.6-18