

This manual must be kept on
the machine at all times.



BROUWER SOD HARVESTER

RoboMax^{JD}

John Deere. Model 6110M Tractor

OPERATOR'S MANUAL



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Sod Harvester
Model 6110M Tractor.

Operator's Manual

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RoboMaxJD

Sod Harvester

Foreword

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 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 Turf Inc. 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, 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

Brouwer Sod 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..

The **Brouwer RoboMaxJD** Sod 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

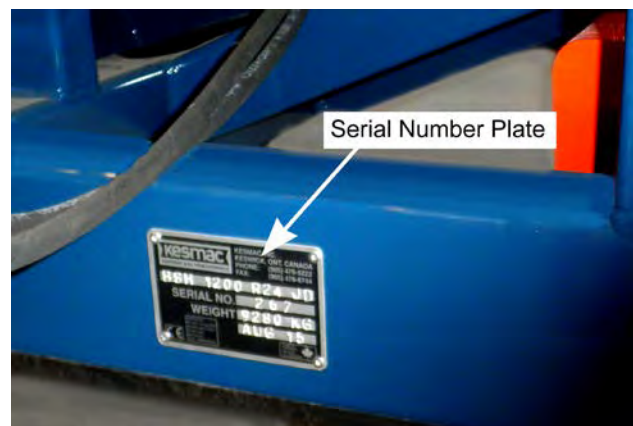
MODEL NUMBER

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



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Specifications

Conveyor.	Rubber or Mintex Metal.
Cutting Head.	Full Floating.
Width of Cut.	16in.(406mm). 23in.(584mm). 24in. (610mm).
Length of Cut.	24in.(610mm) to 100in.(2540mm).
Thickness of Cut.	Hydraulically Adjustable to 3in. (760mm).
Pallet Size.	Standard 48 x 48 in. (1200 x 1200mm).
	<i>Optional Pallet sizes available.</i>
Cutter drive.	Variable Hydraulic.
Conveyor Drive.	Variable Hydraulic.
Cutting Blades.	Standard with Fingers / V-Blade.
Construction.	High Strength Steel Weldment.
Total Weight. With: D/S Pallet Injector. 24in. Conveyor.	22420 lbs. (10170kg).
S/S Pallet Injector. 16 in Conveyor.	21517 lbs. (9760kg).
Overall Length.	294 in. (7468mm).
Overall Width.	170 in. (4318mm).
Transport Width.	140 in. (3353mm).
Overall Height: Operating.	112 in. (2845mm).
Shipping.	104 in. (2642mm).
Pallet Configuration.	Pyramid or Flat Top.
	(Upper Level Squeeze Function).
Flap Control.	Individual – Automatic.

Tractor Model.

John Deere 6110M

IMPORTANT

Refer to the Tractor Operator's/Service Manual that is supplied with the harvester for complete specifications, operating and service instructions.

Keep the manuals on the machine at all times.

This machine is covered by one or more of the following patents:

U. S. Patents		
3,590,927	4,345,659	5,775,436
3,790,096	4,621,696	6,056,064
4,015,566	4,832,130	
4,018,287	4,944,352	
4,029,152	4,903,778	

Other patents pending.
Also patented in other countries.

THIS MACHINE CANNOT BE COPIED IN WHOLE OR IN PART FOR OWN USE OR RESALE.

BROUWER
EQUIPMENT BUILT FROM EXPERIENCE

015899

Due to the Brouwer policy of continual product development specifications may change without notice or obligation.

SECTION 1

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WARNING

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

Brouwer Kesmac 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 Kesmac 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.

Brouwer Kesmac cannot stress too strongly the importance of Owners/Operators adhering strictly to the safety recommendations as stated in this manual.



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 **RoboMaxJD** Operator's Manual, and also the tractor Owner/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 warning decals. If there are any questions concerning safety, do not operate the machine until they are clarified.
All 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, safe working 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 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 that the 'operator presence' interlock switch is working. After getting off the seat there is a 5 to 10 second delay, then the harvesting system will shut down.
- 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.



WARNING

To prevent unauthorized persons having access to the cab:

The cab door must be kept locked when in service, and the key in possession of the service person

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 areas and pallet cavity, it may move suddenly and result in serious injury.
- Use counterweights, wheel weights or ballast, only as recommended by the manufacturer.
- Exercise caution when approaching or crossing roadways.
- Before dismounting: Put the Transmission Range Selector Lever in '**PARK**' and the **F-N-R Lever** in '**Neutral**'. Leaving the transmission in gear with the engine stopped **will not prevent the tractor from moving**.



WARNING

Never attempt to get on or off the machine when it is moving.

Before leaving the operating position, place the Transmission Selector in 'Park', the F-N-R Lever in Neutral. Lower the cutting head and the 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 starter 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 '**PARK**' and 'F-N-R' Lever in 'Neutral'.

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 machine without adequate engine 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, always 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.



WARNING

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

- Engage the Conveyor and Depth Control Levers Locks when in transport
- 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 five to ten 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 '**PARK**'. Place the F-N-R lever in 'Neutral' and stop the engine. Before leaving the operator's seat, wait for the engine and moving/rotating parts to stop. Remove the ignition key.

NOTE

Engage the Parking Brake.

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.

Do not enter the Forks/Piling Cavity area when the engine is running.

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 hydraulic 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 the Gripper Head onto rolls of sod on the Index Conveyor. Lower Cutter Head and Forks to the ground, disengage all drives. Put the Transmission in 'Park' and the F-N-R Lever in 'Neutral'. **Engage the Parking 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 connections and areas to be worked on. Cap and plug any fittings that are disconnected.

- Before disconnecting, tag or mark the disconnections.
- 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 the 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 tractor manual.
- 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 tractor tires are loaded with liquid ballast, and are **extremely heavy. Exercise caution when removing or replacing them.** Use suitable tools, equipment and hoists with adequate lift capacity. **Only qualified and experienced personnel must service the wheel assemblies.**

Liquid Ballast Information.



CAUTION

Installing liquid ballast requires special equipment and trained personnel. The job should only be done by your dealer or a specialized tire store. A tire must never be filled more than 90%. Air space must be left to absorb shocks or damage to a tire could occur.

A solution of 'AGRI-LIM' in water is a safe and economical ballast. Installed correctly it will not cause damage to tires, tubes or wheel rims. The use of alcohol is not recommended.

The two front tires and the left rear tire require ballast.



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.



DANGER

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 will result in serious injury or death

- When inflating tires use a clip-on chuck, and a 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.

SAFETY

Proper Waste Disposal.

- Improper waste material disposal is harmful to the environment. Some potentially harmful product 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 could mistakenly drink from.
- Do not pour waste fluids onto the ground, down a drain or into a 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.
- 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

Exercise extreme caution and verify proper locations when removing/installing Controller Connections.



CAUTION

To protect the Electronic Controllers from damage :
Do not do any welding on the machine until :

- The Battery cables are disconnected.
- The Controllers are disconnected.

Reference the Decals as shown on the following pages.

NOTE

In cases where replacement Decals are required in German; Dutch; or Italian, the same part number will apply except it will have a suffix – e.g : D001-249D. (Dutch).
D001-249IT. (Italian).
D001-249G. (German).

For Example:



VOORZICHTIG

Voor het beschermen van de elektronische controllers tegen schade:
Geen laswerk uitvoeren aan de machine totdat:


- De accukabels zijn losgekoppeld.
- De controllers zijn losgekoppeld.

D001-249D

D001-250

CAUTION

For Lubrication Procedures
Consult Operator's Manual



D001-221


CAUTION

To prevent damage to the bearings,
DO NOT pressure wash the top
seal face of the Slewing Ring.

CAUTION

STOP ENGINE BEFORE
ATTEMPTING INSPECTION,
CLEANING, OR ADJUSTMENT.

00-283



413687

WARNING

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

D001-054

WARNING

CRUSHING HAZARD
Stay clear of moving parts

D001-024

WARNING

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

4136687

WARNING


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

At both ends
4135014

WARNING

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

4135016



WARNING

ROBOT ARM CAN CRUSH.
GRIPPER FINGERS CAN
PIERCE OR CRUSH.
-MOVEMENT CAN OCCUR
UNEXPECTEDLY
-STAY CLEAR WHILE ENGINE
IS RUNNING
-STOP ENGINE BEFORE
SERVICING.

4135014

D001-032

WARNING

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

4135015

WARNING

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

D001-223

WARNING

KEEP WELL CLEAR OF THIS AREA AT
ALL TIMES.
Gate can open and close without warning.

Two places

WARNING


KEEP CLEAR OF CONVEYOR.

015900

WARNING

CRUSHING HAZARD
Stay clear of moving parts

D001-054



EMERGENCY STOP
PUSH TO STOP

D001-128

WARNING

KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH
SHIELD REMOVED.

00-370

WARNING

The operator must be aware that:
When an Emergency E-Stop Switch is activated
it only stops the harvesting functions. IT DOES
NOT STOP THE TRACTOR ENGINE, OR APPLY
THE BRAKES.
The tractor will continue to travel until the operator
de-clutches and applies the brakes.

D001-187

WARNING

PUSH TO ACTIVATE
EMERGENCY STOP
When servicing to prevent
Serious injury or Death.

D001-129

015900

CAUTION

AVOID INJURIES, ENGAGE AUTO-STEER ONLY WHEN HARVESTING.

015499

CAUTION

Do not step on conveyor at any time

D001-116

CAUTION

To avoid injury **DO NOT EXIT** the driver's area from this side of the tractor.

D001-113

D001-113

D001-200

Thin ← DEPTH CONTROL → Thick

Lower ← CUTTER HEAD → Raise

D001-236

CAUTION

4133093

WARNING

To prevent serious injury or death the operator must read the safety warnings and instructions in the Machine and the Engine Operator's manuals. The manual must be kept near the operator at all times.

- The operator **MUST NOT** leave the operator's seat while the engine is running; the system will return to neutral and the engine will stop.
- **DO NOT** attempt to make any adjustments, use any optional machines or use other attachments in the vicinity of the Operator's seat.
- **DO NOT** leave the tractor unattended while the engine is running.
- **DO NOT** leave the tractor unattended while the engine is running.
- When leaving the machine unattended, place the Control Handle in **NEUTRAL**, stop all functions, lower the Conveyor and Pallet Forks in the ground and the Discharge into side of the Infeed Conveyor. Shut the engine, remove the Operator's seat and lock the seat.
- Turn the battery isolate switch to **OFF** and lock it in place.

D001-222

D001-210

2000653

This machine is covered by one or more of the following patents:

U.S. Patent	5,345,889	5,715,436
3,992,827	4,221,246	6,098,054
3,795,586	4,812,130	
4,015,546	4,894,152	
4,015,257	4,894,152	
4,025,152	4,894,152	

Other patents pending. Also patented in other countries.

THIS MACHINE CANNOT BE COPIED IN WHOLE OR IN PART FOR OWN USE OR RESALE.

BROUWER

Inside rear window

WARNING

To prevent component, mechanical damage, or personal injury:

DO NOT TURN the SYSTEM POWER OFF then ON again within 10 seconds.

D001-352

IMPORTANT

GREASE MACHINE AS INSTRUCTED IN OPERATOR'S MANUAL.

D001-218

CAUTION

To protect the Electronic Controllers from damage:

- Do not do any welding on the machine until:
- The Battery cables are disconnected.
- The Controllers are disconnected.

D001-249

D001-181

WARNING

CRUSHING HAZARD

To prevent serious injury, stay clear of moving parts.

D001-053

LIQUID FILLED

Both front wheels and left rear only. Two per wheel.

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 operator's seat only. Failure to do so could result in death or serious injury.

00-266

D001-054

D001-228

D001-228

D001-033

WARNING

To prevent serious injury or death:

- Avoid contact with moving parts.
- Do not attempt to use or adjust the machine without reading and understanding the operator's manual.
- The machine is not to be used for any other purpose than intended.

D001-033

WARNING

CRUSHING HAZARD

Stay clear of moving parts

D001-054

WARNING

The operator must be aware that:

When an Emergency E-Stop Switch is activated it only stops the harvesting functions, it **DOES NOT STOP THE TRACTOR ENGINE, OR APPLY THE BRAKES.**

The tractor will continue to travel until the operator de-clutches and applies the brakes.

D001-187

D001-187

WARNING

PALLET DISPENSER CAN CRUSH.

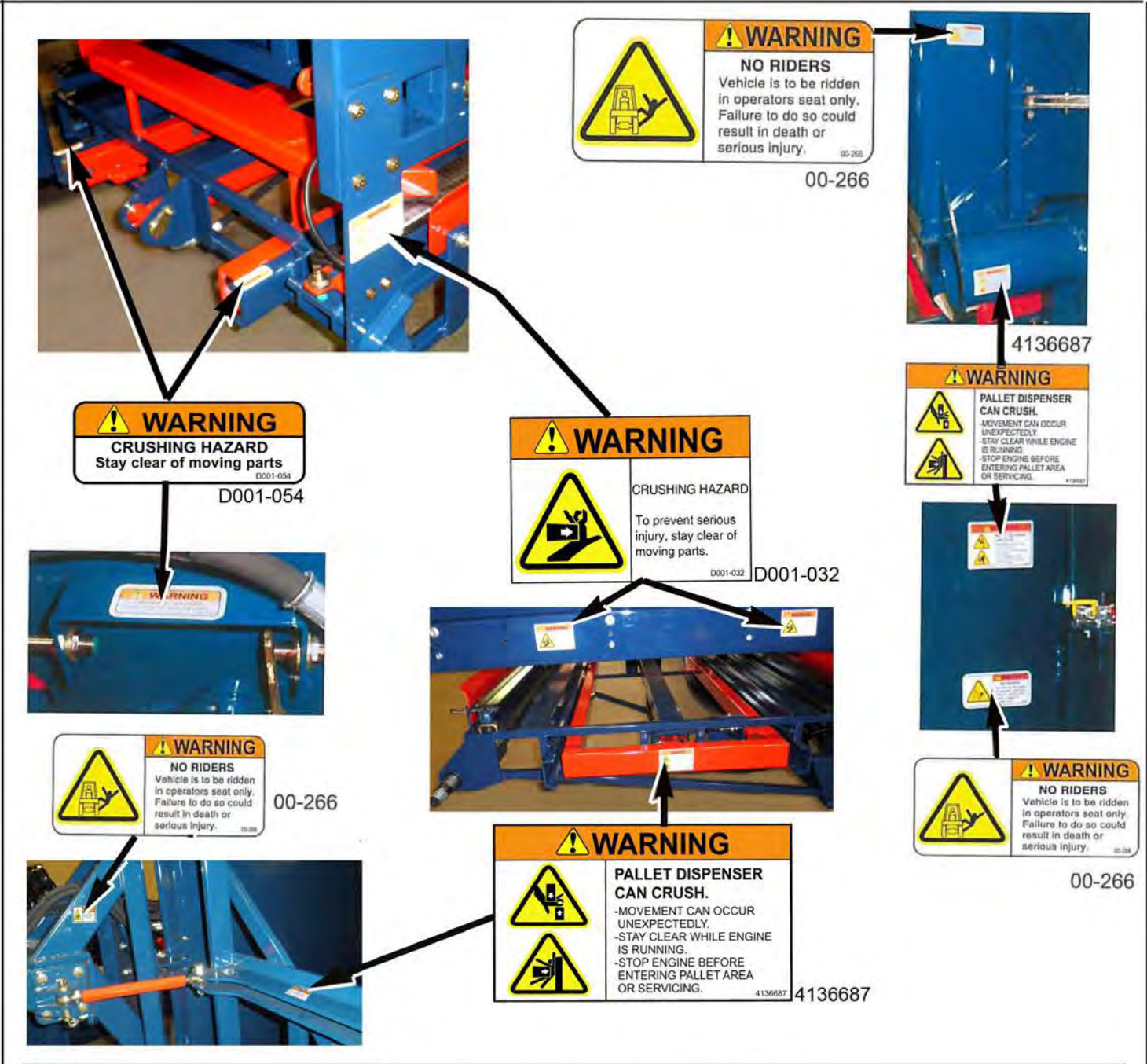
MOVEMENT CAN OCCUR UNEXPECTEDLY.

- STAY CLEAR WHILE ENGINE IS RUNNING.
- STOP ENGINE BEFORE ENTERING PALLET AREA OR SERVICING.

4136687

DECALS

Optional 2-Sided Pallet.

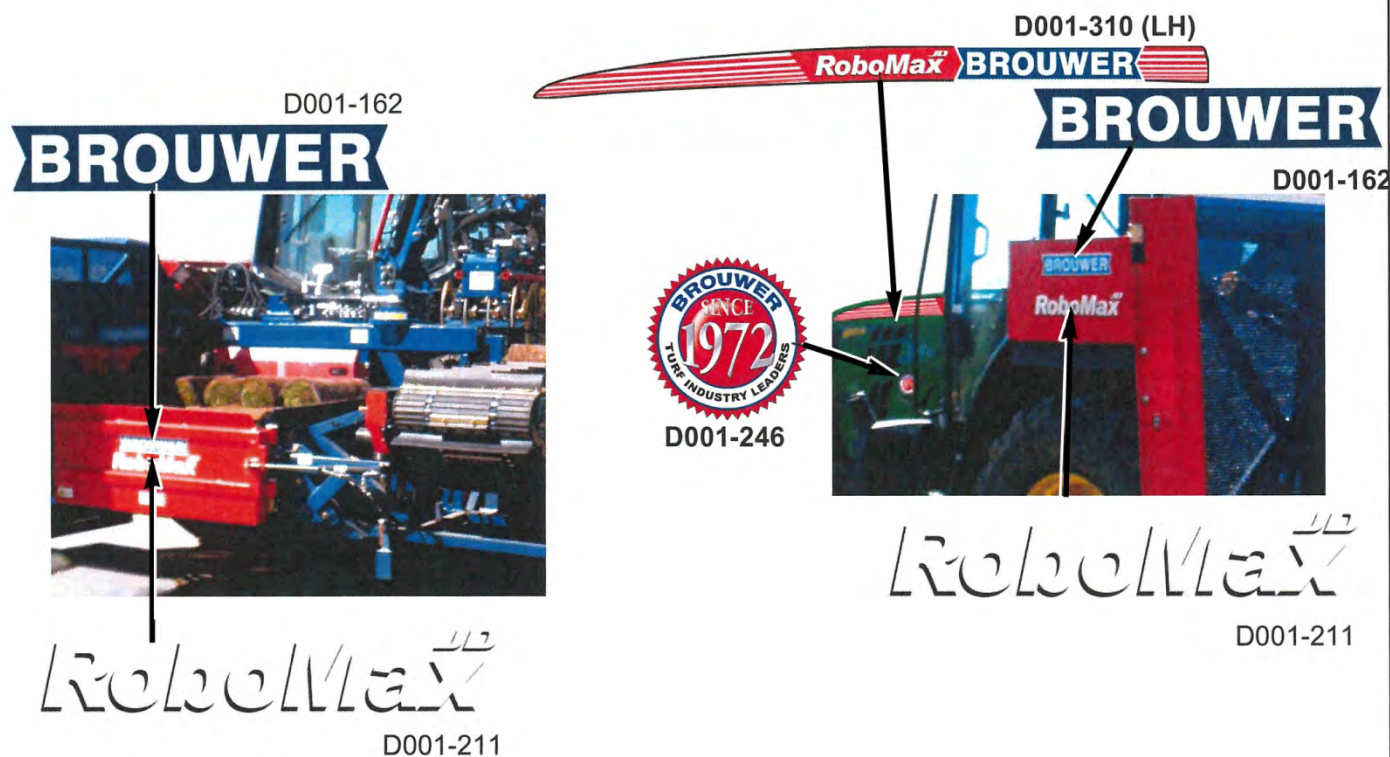
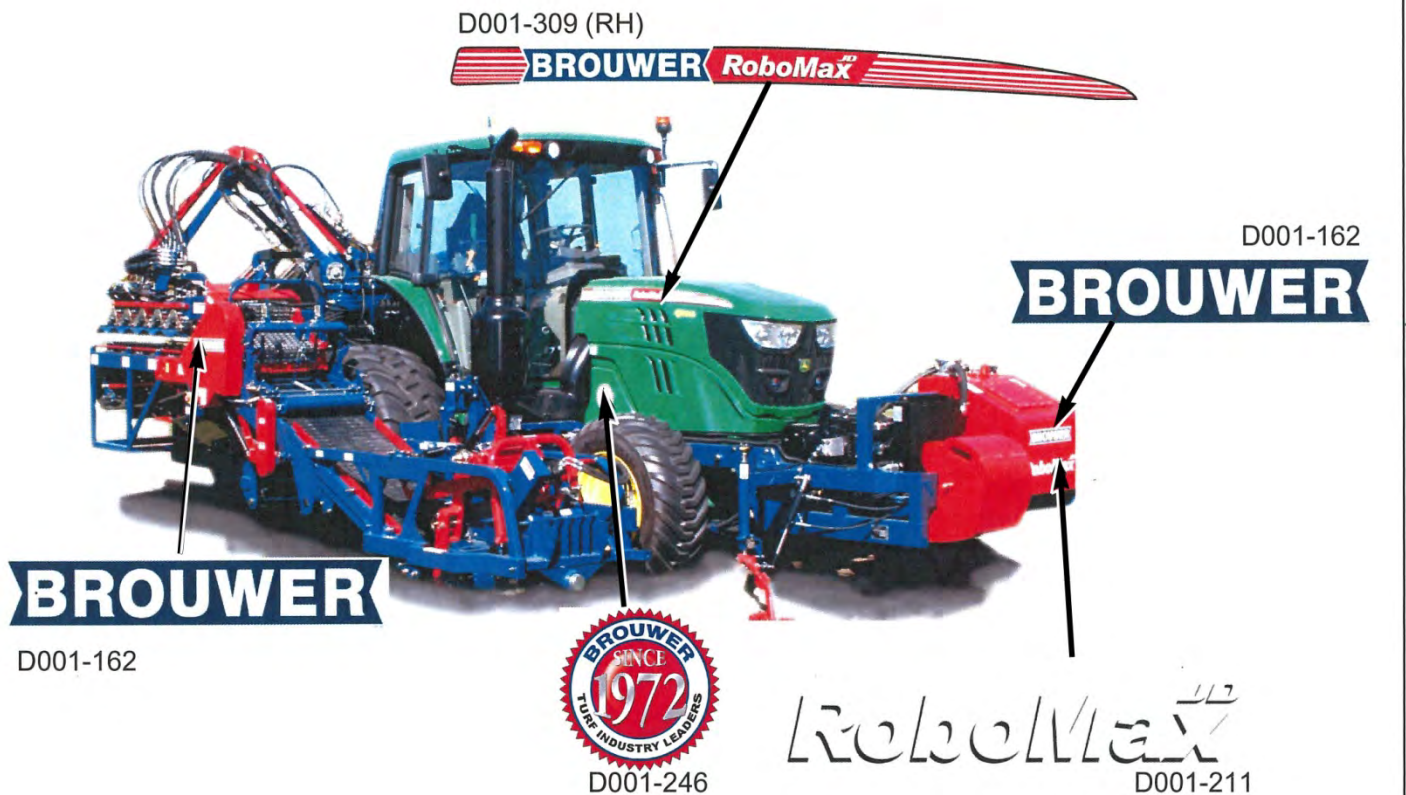


DECALS Optional Brush Attachment.

WARNING
KEEP ALL SHIELDS IN PLACE.
DO NOT OPERATE UNIT WITH SHIELD REMOVED.
00-280



WARNING
THROWN OBJECTS
-REMOVE POTENTIAL THROWN OBJECTS.
-DO NOT OPERATE BRUSH ATTACHMENT NEAR BYSTANDERS.
-STAND CLEAR WHEN IN OPERATION.
00-369



SECTION 2**Cab Controls**

System Control Panel.(Controller 'A').	2-01
System 'ON-OFF' Switch.	2-01
E-STOP.	2-01
Auto-Steer Fine Adjust.	2-01
Tractor Command Center Panel.	2-01
Control Handle. See page 2-02.	2-01
Transmission 'RANGE' and Gear Selection Lever.	2-01

Control Handle

Function Pads and Auto-Steer Switch.	2-02
--------------------------------------	------

Console Controls

Cutter Head and Depth Control Levers.	2-02
---------------------------------------	------

Control Panel Screens.

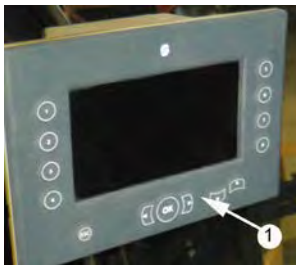
Initial Start.	2-03
Stacking Pattern Selection.	2-03
Configuration Sub-Screen.	2-04
Stacking Pattern Selection Screen.	2-04
Inactive Stacking.	2-04
Pallet Position Auto Setting.	2-05
Pallet Lift Forks 'Cycling'.	2-05
Active Stacking Screen Mode.	2-05
Manual Mode. Control Valves.	2-06
Pallet Lift Forks 'Lift – Lower' functions.	2-06
Gate 'Open-Close'.	2-06
Step Sequence Screen.	2-07
Active Pallet – 'Full' Screen.	2-07
Inactive Pallet – 'Full' Screen.	2-07
Pallet Forks Height and Pallet Count.	2-08
Pallet Weight Option.	2-09

1. RoboMax System Control Panel. Controller 'A'.
 - Operating Screens can be called up for each sequence of operation.
Refer to following pages.
2. System Power 'ON-OFF' Switch
3. Emergency 'STOP'- Push to 'STOP'.
- Pull and twist CCW to 'RESET'.
- 3a. The 'outside' E-STOP is located at the right hand side below the Roll-Up Drive Cover.
4. Control Handle
5. Transmission Range Selection Lever.
6. Conveyor Speed Control.
7. Cutter Speed Control.
8. Auto-Steer Fine Adjust Control.
9. Cutter Head 'Up-Down' Lever.
10. Depth of Cut Control.
11. Tractor Throttle Speed Control.
12. Gear Selection Switch



CAUTION

When activated the E-STOP does not stop the tractor motion, **only Harvesting Operation.**



NOTE

The Cab Display is fully adjustable to suit operator preference

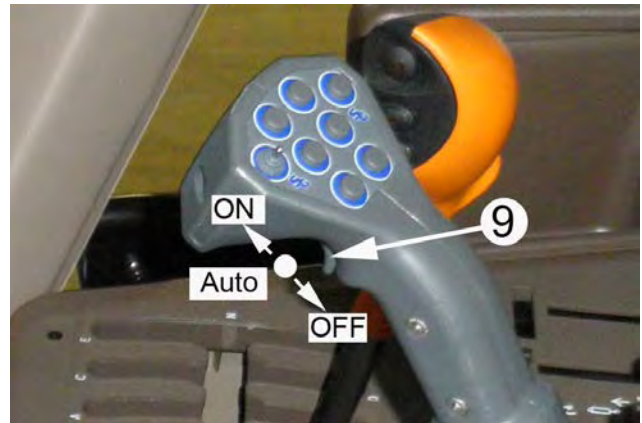
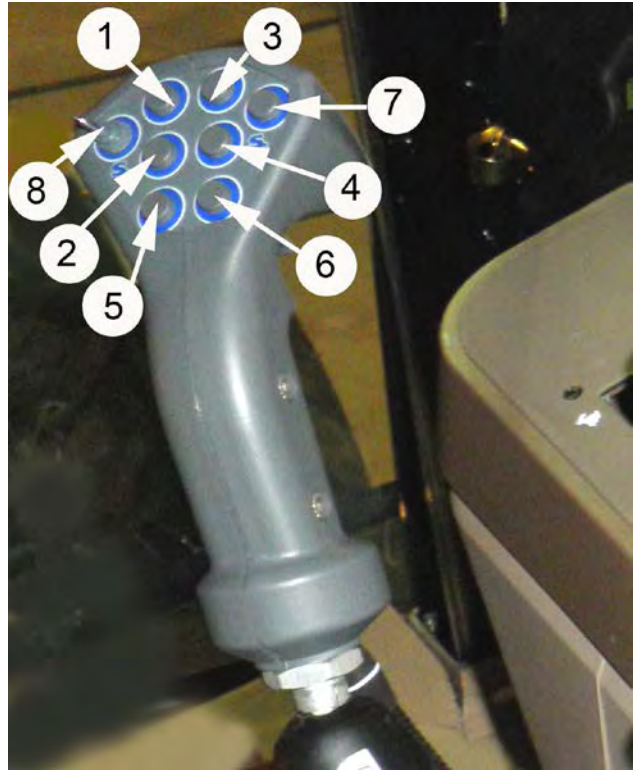


CAB CONTROLS

Control Handle.

The Control Handle allows easy operation of the following functions:

1. Roll Transfer –Tooth Count – Increase
2. Roll Transfer –Tooth Count – Decrease
3. Roll Size – Increase.
4. Roll Size – Decrease.
5. Conveyor 'ON-OFF'.
6. Cutter 'ON-OFF'
7. Bad Roll Eject
8. Auto-Steer 'ON-OFF' Switch.
9. Trigger - Auto System 'ON -OFF'



Trigger - Auto 'ON-OFF'.

Control Levers.

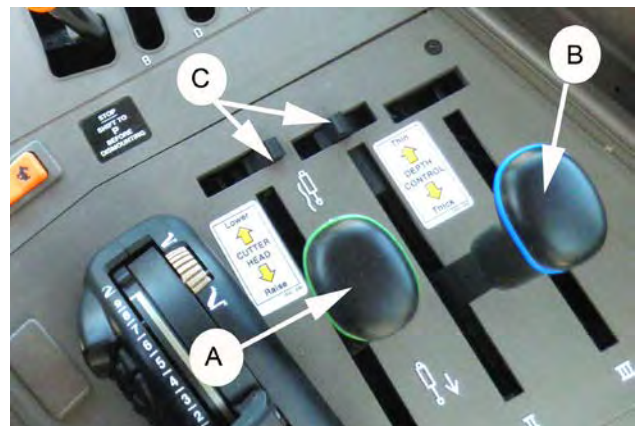
The Levers are located on the console to the right of the operator :

- Lever 'A' - Cutter Head 'Lift-Lower'.
- Lever 'B' - Depth Control 'Thick-Thin'.



WARNING

When in transport, to prevent accidental lowering of the Conveyor and Cutter Head:
The Control Levers Locks 'C' *must be engaged*.



Control Panel Screens.

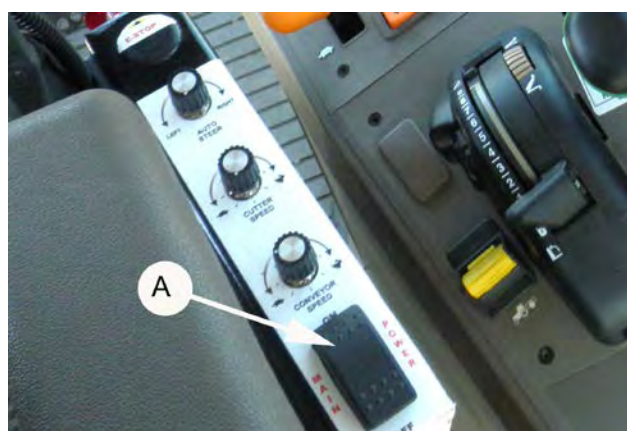
Initial Start Screen.

The Initial Start Screen is displayed when the tractor ignition key is switched to 'ON', and the RoboMax System Power Switch 'A' is switched to 'ON'.

- After the flashing RED 'WAIT,' in top left corner 'stops', press Pad '1', to start the Controller and bring up the Stacking Pattern Selection Screen.



Initial 'START' Screen

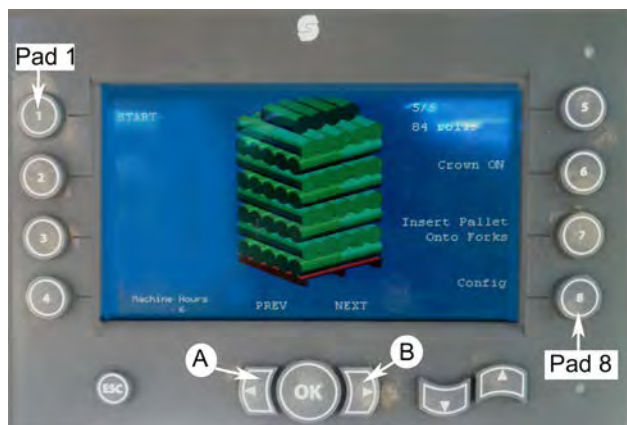


Stacking Pattern Selection Screen.

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'.
- Press Pad '8' to go to Configuration Sub-Screen.

Note: Pad 6 'Crown' ON/OFF – Option.

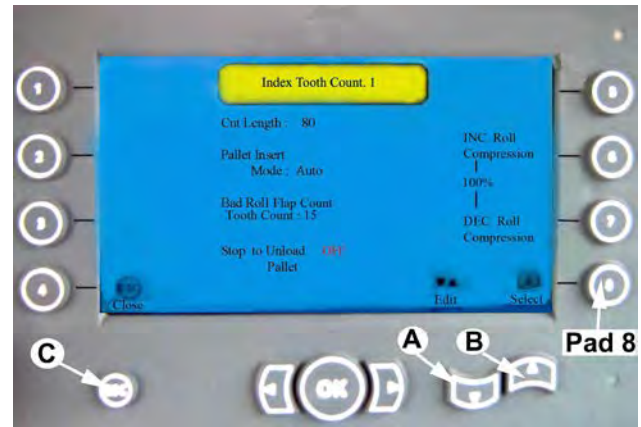


Stacking Pattern Selection Screen

CAB CONTROLS

Configuration Sub-Screen.

- Press Pad '8' to select Index Tooth Count. Adjust with Arrows 'A' and 'B'.
 - Press Pad '8' for 'Cut-Length' selection. Adjust with Arrows 'A' and 'B'.
 - Press Pad '8' for Pallet Insert Mode. Use Arrows 'A' and 'B' to select 'Auto' or 'Manual' mode.
 - Press Pad '8' to select Bad Roll Differential. To adjust the Differential press Arrows 'A' or 'B'.
 - Press Pad '8' to go to Stop to Unload – 'ON/OFF'.
 - Press Pad 'C' (ESC) to close and return to previous screen
- Press Pad 6 or 7 to change the percentage value, 'UP' or 'DOWN', to affect Roll Compression

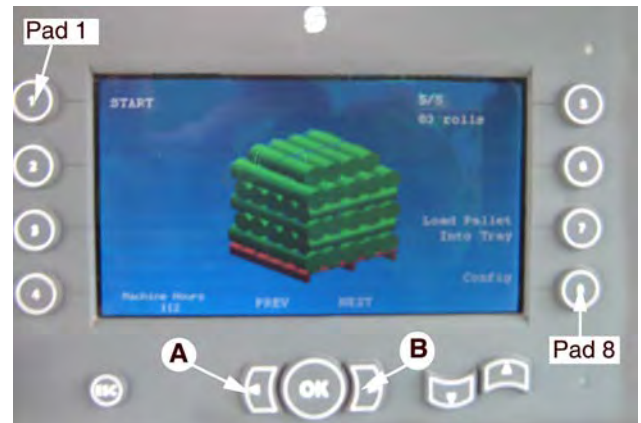


Configuration Sub-Screen

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' (previous), or the right arrowed Pad 'B' (next), to toggle between the selections.
- Press Pad '1' (Start), to bring up the 'Inactive Stacking Screen'.
- Press Pad '8' to go to Configuration Sub-Screen.



Stacking Pattern Selection Screen

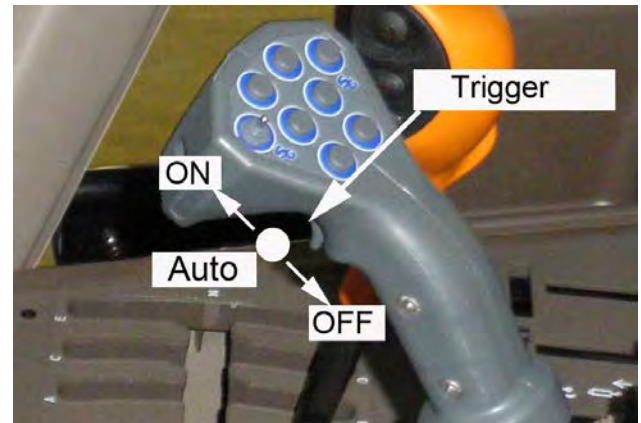
Inactive Stacking Screen.

Inactive Stacking Screen is displayed **during Initial Start Up**. There is a **90 second delay** before Pad 2 (Move Manually) is 'Active'.

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

Press Pad '1' (start) to go Green 'READY'.

To activate Pad '2', press Pad '1' once to go 'READY', and 'push' Trigger on Control Handle to go 'AUTO'. Squeeze Trigger to 'STOP'.



WARNING

To prevent possible injury or damage to the machine, activating Pad '1' must only be done when the Gripper Head is over the Index Conveyor and the Roll Count is not greater than six.

- Press Pad '3' and hold for 3 seconds, to reset the Pallet Counter to zero.
- Press Pad '4' to indicate a new pallet. 'Empty Pallet' will be displayed, and the pallet roll quantity will reset to zero. (The forks will not move in 'Inactive Screen'.
- Press Pad '8' to highlight 'Down pressure'. Adjust with up-down arrows 'A' and 'B'.
- Press Pad '1' – RED Indicator will change to GREEN.



Inactive Stacking Screen

Control Panel Screens.

When first starting operation, i.e. when 'COLD'. Press **Pad '1'** to go Green 'READY',

IMPORTANT

The Eject Tooth Count, the Index Tooth Count and the Bad Roll Diff' when added together **must be zero or greater**. If not the screen will display 'Constrain Value'. It will require the Bad Roll Diff' value to be adjusted to arrive at zero or greater.

- Press Pad '8' to highlight Down Pressure. Adjust with Arrows 'A' and 'B'.
- When Indicator is **RED** – Press Pad 'C' to go to Calibration Screen. See Page 2-06.
- Press Pad '1', **RED** Indicator goes **GREEN** – 'Ready'.
- Operate the Trigger on the Control Handle to go the 'Auto Mode'. See below.
- The Cutter starts.
The Conveyor starts.
- Press Pad '7' **rapidly, (1 sec.)** to allow the pallet to be dropped 'off line'. When in position to drop the pallet hit Pad '7' again to release the pallet.
- If all pallets are to be dropped 'off line' – Press Pad '7' and hold for 3 to 5 seconds until flashing 'YELLOW' symbol appears on the screen.

Active Stacking Mode Screen

- The Roll Size and Roll Eject Tooth Count are adjusted on the Control Handle Pads. See page 2-02.
- Press Pad '4' to advance the Index Conveyor 'one' Position, or press Control Handle Trigger 'UP'.
- When the Pallet is approaching 'FULL', the Warning Lamp will start flashing and the 'beeper' will sound.
- Press Pad '6' for Bad Roll Differential
Press 'Up' Arrow 'A' and 'Down' Arrow 'B' to adjust the flap on the roll following the scrapped roll.

NOTE

The harvesting operation is automatic. However, if it is necessary to stop the Auto Mode, the Trigger on the Control Handle must be used.



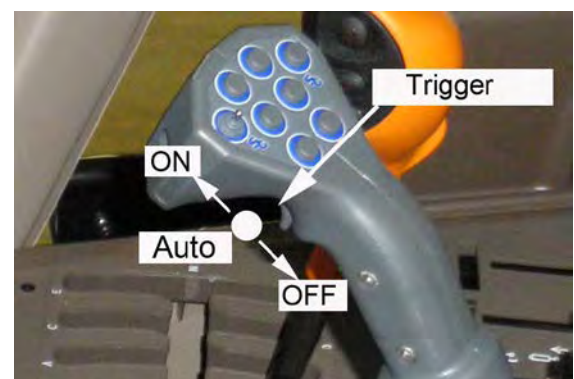
Pallet Position 'Auto' Setting



Pallet Lift Forks 'Cycling'



Active Stacking Mode Screen.



CAB CONTROLS

Manual Mode Screen.



CAUTION

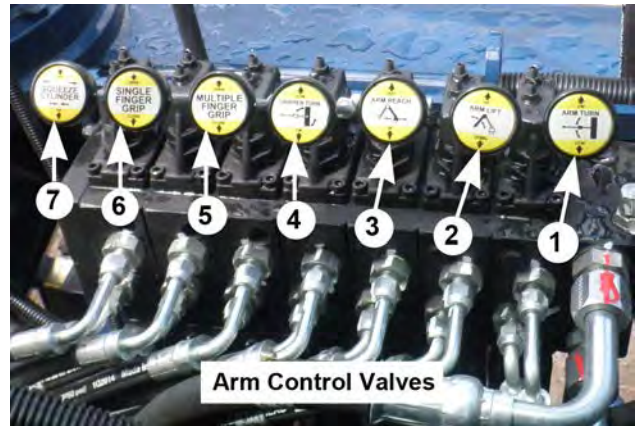
Arrows 'A' and 'B' (See below on Control Panel) will adjust the movement of the Arm, but it is recommended that the Control Valve Levers are used for this purpose.

IMPORTANT

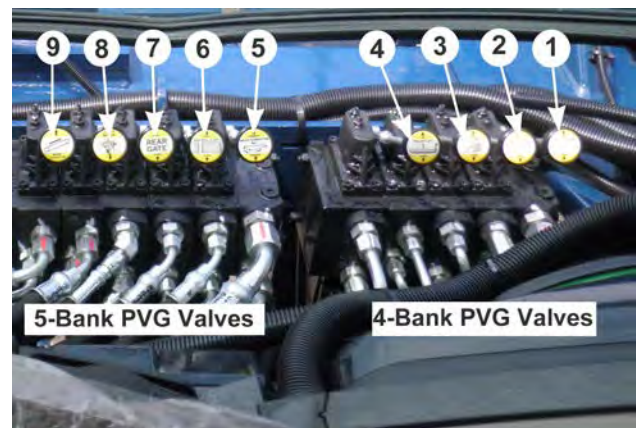
The manual operation of the Control Valves Levers must only be done during service, to check the operation of the Arm or other functions.

OR:

If a cylinder fails, or some other malfunction occurs, in mid operation, the operator can use the appropriate lever to return the Arm to its proper position, i.e. over the Index Conveyor.



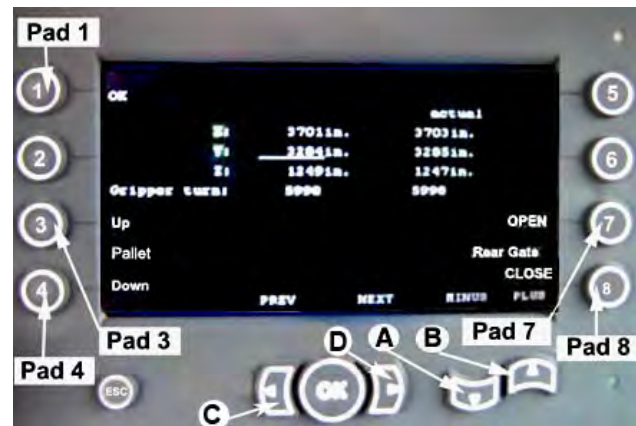
1. Arm Rotate. 2. Arm Lift. 3. Arm Reach. 4. Gripper Turn.
5. Grip-Multi Finger. 6. Grip-Single Finger. 7. Squeeze.



1. Drop 2. Load. 3. Pallet 'Rotate'. 4. Forks. 5. Index Con -
- veyor. 6. Eject. 7. Gate. 8. Cut-Off. 9. Main Conveyor.

Pallet Lift Forks 'Lift' and 'Lower' functions. Gate 'Open-Close'.

- 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**.
- Press : **Pad '7' to 'open' Rear Gate.**
Pad '8' to 'close' Rear Gate.
- Press Arrow '**A**' (Decrease) Arrow '**B**' (Increase) '**X**', '**Y**' '**Z**' Axis and Gripper Turn.
- Pad '**C**' and '**D**' to scroll between values.
- Press Pad '**1**' to return to Inactive Stacking Screen.



Step Sequence Screen

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

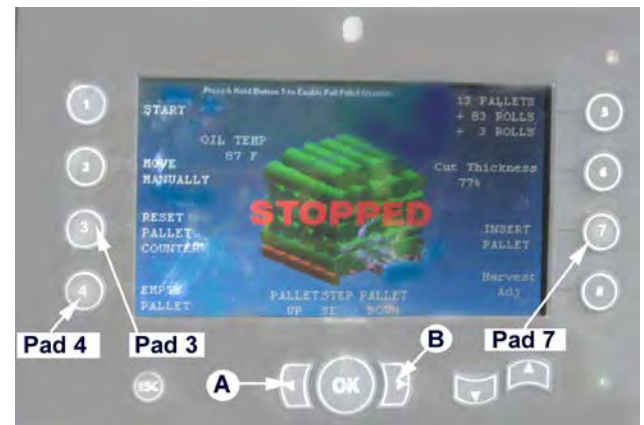
- Press **Pad '1'** to return to the **Inactive Stacking Screen**.
- Press the **'Left Arrow Pad' 'A (prev.)** to **remove five sod rolls** from the pallet display. In some cases this may be four rolls.
- Press the **'Right Arrow Pad' 'B' (next)**, to **add five sod rolls** to the pallet display.
- Press the **'UP' Arrow Pad 'C' (plus)** to **add sod rolls** to the **Index Conveyor Count**.
- Press the **'DOWN' Arrow Pad 'D' (minus)** to **subtract sod rolls** from the **Index Conveyor Count**.



Step Sequence Screen



Active Pallet 'FULL' Screen



Inactive Pallet 'FULL' Screen.

Active Pallet 'FULL' Screen.

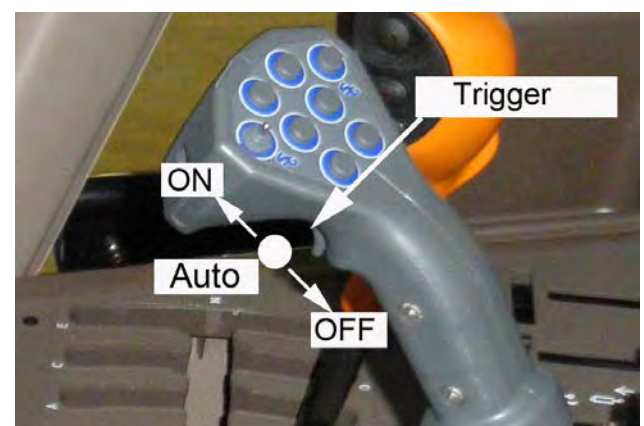
The **'Active Pallet Full'** Screen is automatically displayed when the pallet is completed.

- Squeeze Trigger on Control Handle to display **Inactive Pallet Screen**. See below.

Inactive Pallet Full Screen.

The Inactive Pallet Full Screen is displayed when the Trigger on the Control Handle is 'squeezed'.

- Press Arrow **'A'** to raise the Pallet Lift.
- Press Arrow **'B'** to lower the Pallet Lift.
- Drive clear of the pallet, then press Pad **'7'** to initiate the **Pallet Dispense Sequence**. This only applies if in the **'MANUAL'** injection mode.
- Press Pad **'3'** to reset the Pallet Counter to **'zero'**, if necessary.
- Press Pad **'4'** 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 proceed to **'Active Screen'**.
- Press Pad **'1'** to go GREEN **'READY'**, then push the Trigger on the Control Handle to go **'AUTO'**.



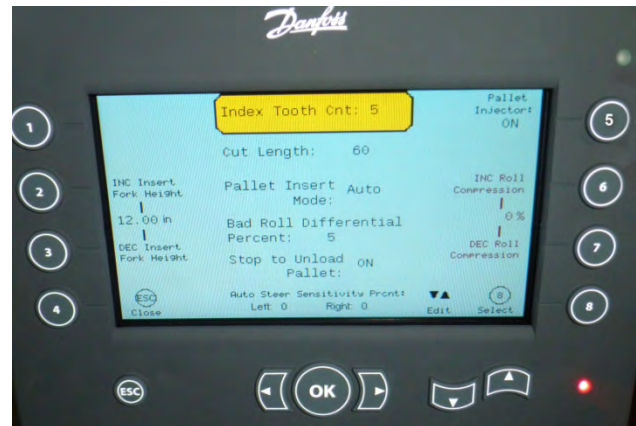
Control Handle.

CAB CONTROLS

Pallet Fork Height.

When inserting a pallet :

Adjust the pallet forks height to the required height using Pads 2 and 3.



Pallet Fork Height

Pallet Count

When necessary, adjust the pallet count '+' or '-', using the Pads 2 and 3.



Pallet Count

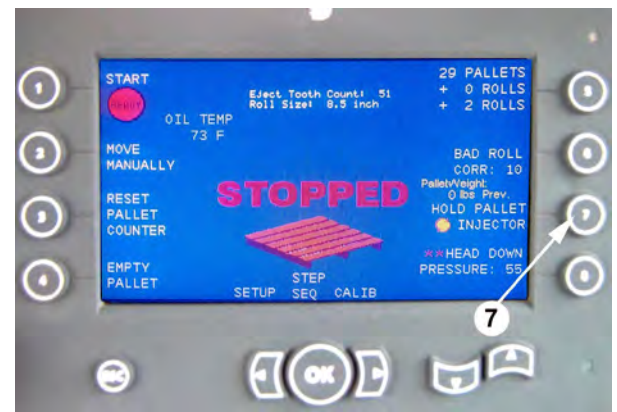
Pallet Weight Option

The Pallet Weight Option is to assist the operator on determining the weight of individual finished pallets. The weight measurements are within 1% of actual weight and is not certified for commercial trade.

- Press Pad '7' (Hold 3 Seconds) to enable Pallet Hold Function.
- When pallet is complete. Pallet will lower 1 inch and weight of pallet is measured.
- After pallet is measured, Press Pad '7' to release pallet.

NOTE

Pallet Weight Operation will only work with Pallet Hold Mode engaged.



SECTION 3

Recommended Operating Speeds.	3-01
Main Conveyor	3-02
4 Inch Feed Roller	3-02
Starter Tray – standard.	3-02
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Index Conveyor	3-03
Roll Flap – Stabilizer. Sprocket Type.	3-03
(See page 3-11 – Optional Roll Flap Stabilizer).	
‘Bad Roll’ Ejection	3-03
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Gripper Head	3-04
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Roll Flap ‘Stabilizer’ – Option.	3-11
Mesh Starter Tray – Option.	3-11
Front Roller – Option.	3-11

Recommended Harvesting Speed.



CAUTION

The operator must read the Tractor Operator's Manual to familiarize himself with the operation of the tractor controls.

OPERATION.

With the F-R-N Lever 'A' in 'NEUTRAL' :

- Depress the Clutch Pedal and start the engine.
- Select 'Range A'. with the Range Shift Lever 'B'
- With Button 'D' on Lever 'B' or Toggle Switch 'E' on the Console, select Gear '4.' (*shows on Rev Counter – at 'C'*).
- Set RPM at 1500 to 1800 with Lever 'F'.
Note - RPM limit can be set with Control 'G'.
- Move F-N-R Control Lever 'A' to 'Forward' then slowly release the Clutch Pedal.

Smoother operation is attained using the clutch pedal, rather than the hand clutch button on the Range Shift Lever.

CUTTER BLADE.

To reduce 'shock loads' to the Cutter Motor, when starting to harvest, the Cutter Blade should be started **before** the Cutter Head is lowered to the ground.

CUTTER BLADE – SPEED SETTING.

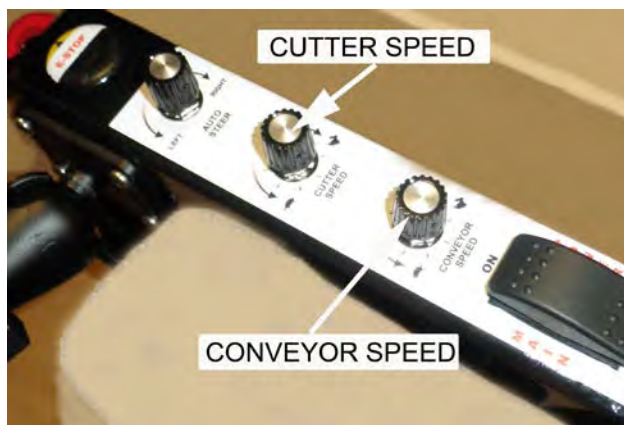
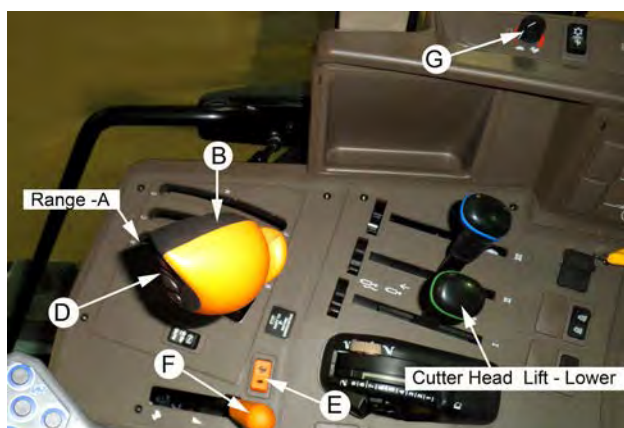
For best results, start cutting at the maximum speed and work back to the lowest speed that gives the best results. Lower cutter speed results in less vibration.

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.

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 oil reaches full operating temperature

When setting the Main Conveyor Speed:

Operate the tractor in the range, gear selection, and engine RPM that will be used when harvesting.

To maintain proper spacing between the sod pieces on the conveyor, keep a constant travel speed.

OPERATION

Main Conveyor



WARNING

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 4 inch Roller 'A' assists in feeding the sod into the Starter Gate. It should be kept free of grass and mud to maintain proper operation.
The Roller is driven by the Mid-Idler Sprocket Shaft that supports the Main Conveyor Mat.

To adjust the Roller:

- Place a piece of sod under the Roller. With the Roller resting on the sod, adjust the Bump Stops 'B' until there is 1/8 inch clearance between the Bump Stops and the Frame.
For weak or thin turf, requiring less roller pressure, adjust the Bump Stops 'down', onto the frame, raising the Roller and reducing the pressure on the turf.

Sod End Sensor. See note opposite.

When the end of the sod passes under the Sensor 'C' this signals the computer to:

- count the number of teeth, ('tooth count'), that the operator has pre-set
- 'Stop' the Roll Transfer Mat, (that transfers the Roll onto the Index Conveyor).

Starter Gates.

The Starter Tray Bars 'E', behind the Starter Gates 'F', have Pins 'G' that protrude 1/4 inch below the Bar.
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 rolled 'incomplete' rolls, in this case the pins should be 'raised'. Trial will determine the best pin positions.

If the sod passes through the first starter gate the second one will 'catch' it.

- 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.

The Starter Gates 'F' must be positioned approximately 1/8 inch clear of the Conveyor Mat, measure at the join 'splice' in the Mat, ie. **its thickest point**.

Gate clearances are set with the adjustable straps 'H'.

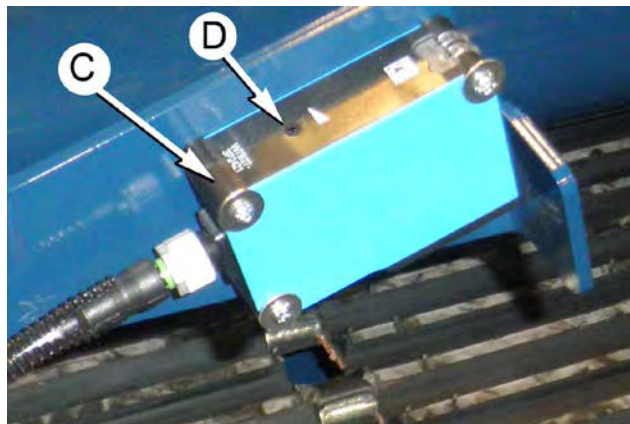
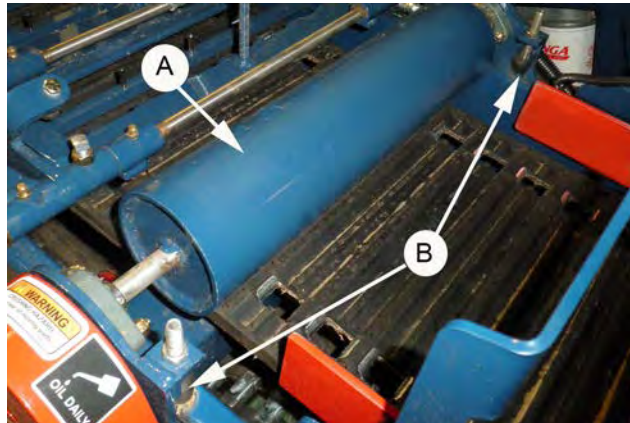
The Gate must not touch the mat.

The Starter Gate Stops 'J', prevent the bottom edge of the Gates lifting higher than the top face of the Bars 'E'.



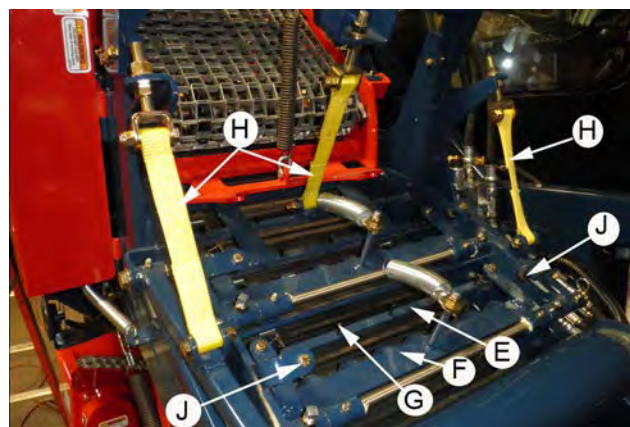
WARNING

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



Note: If the Sod End Sensor is replaced, the new one must be calibrated with Adjuster 'D', following the instructions on page 3-10.

If mechanical sod end sensor is fitted - see page 4-24



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. Adjust the Hanger Chain to allow 2 to 2 ½ inches clearance between the bottom of the Roll-Up Frame and the Starter Tray.

Index Conveyor

The Index Conveyor 'C' is driven by Hydraulic Motor. It is synchronized to the Main Conveyor, Robo Arm and Bad Roll 'Ejection' Cylinder 'G'. When a Roll is ready to be deposited onto the Index Conveyor, a signal from the Controller causes the Index Conveyor to roll back 'one position' to accept the completed roll.



WARNING

Do not attempt to clear jammed rolls or debris while the machine is running. Keep all bystanders well clear of the Index Conveyor, Gripper Head and Pallet Gate and Injection area.

Roll Flap 'Stabilizer'. (Sprocket Type).

(See P3-11 for optional flap stabilizer).

The Roll Flap 'Stabilizer' 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 Sprocket 'E', located at the right rear of the main conveyor. Tooth count is by Sensor 'F'. Increasing the 'tooth count' moves the Roll Flap 'counter clockwise'. Decreasing the 'tooth count' moves the Roll Flap 'clockwise'.

To adjust the Roll Stabilizer Sprockets location to suit the selected position of the Roll Flap. (Viewed from the cab). Loosen the Locknuts 'A' and slide the Sprocket Shaft Assembly 'B', 'UP' or 'DOWN' in the Slots 'C' to obtain the required position.

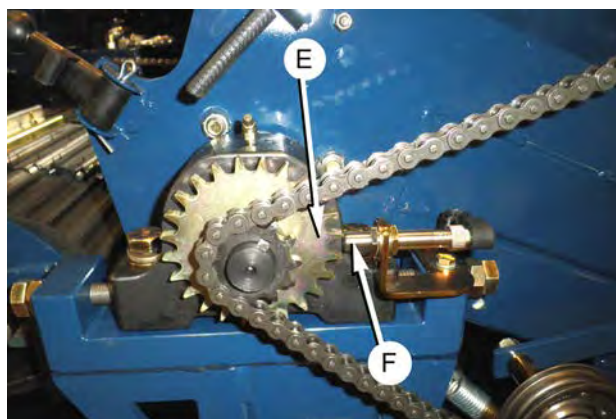
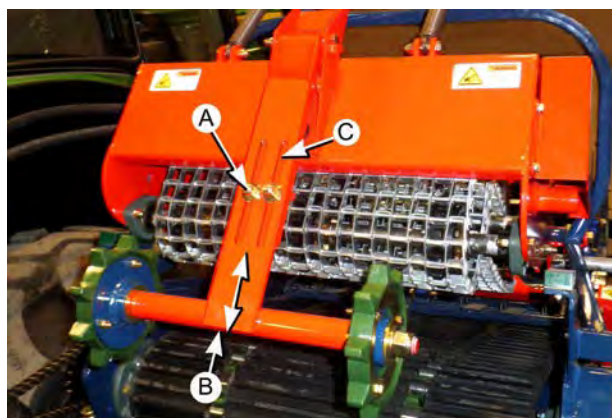
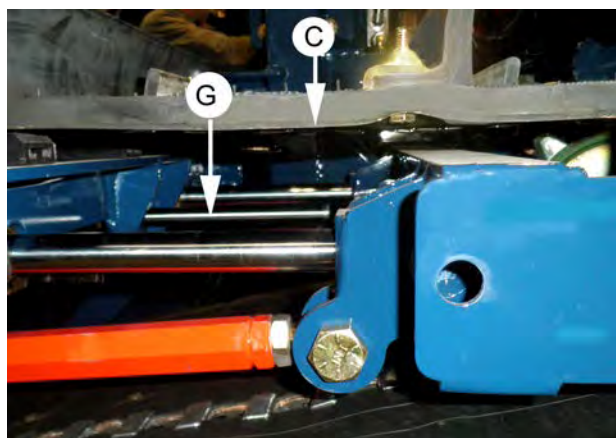
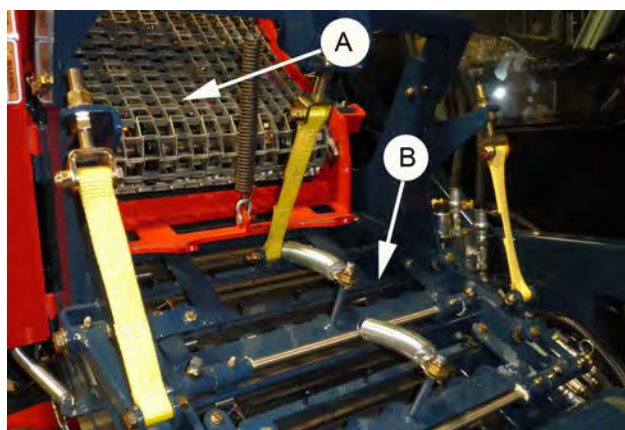
IMPORTANT

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

Bad Roll Ejection

To 'eject' a bad roll of sod, the Index Conveyor is moved back, by Cylinder 'G', and held in that position, allowing the Roll to drop past the Conveyor to the ground.

To activate the Roll Transfer refer to the Controls Section, page 2-02.



OPERATION

Robotic Arm and Gripper Head.

The hydraulic functions of the Robotic Arm 'A' are controlled by one of three Controllers in the Main Control Box, through Proportional (PVG) Valves. (See Section 5). The 7-Bank Arm Control Valves 'B', are located immediately to the rear of the cab window.

The relevant Controller provides positioning co-ordinates for:

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

The Robotic Arm, responding to the Controller commands, picks up and transfers the rolls from the Index Conveyor 'C', to the Pallet.

NOTE

Refer to page 2-06 for lever functions.

Gripper Head

The Controller also controls :

- the manipulation and 'squeeze' functions and of the Gripper Fingers 'D'.

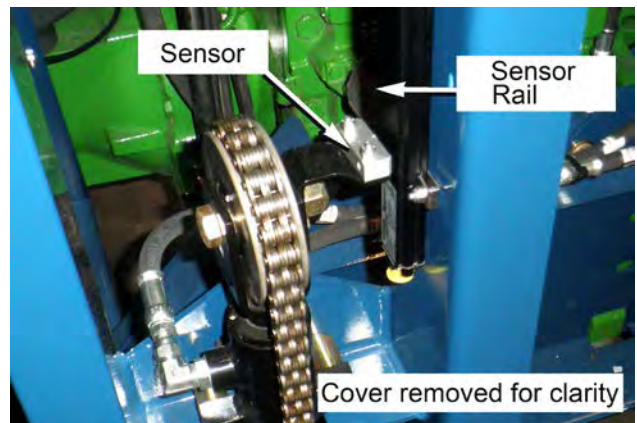
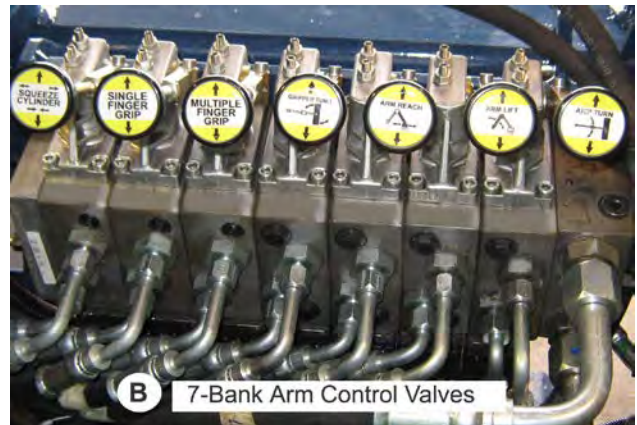
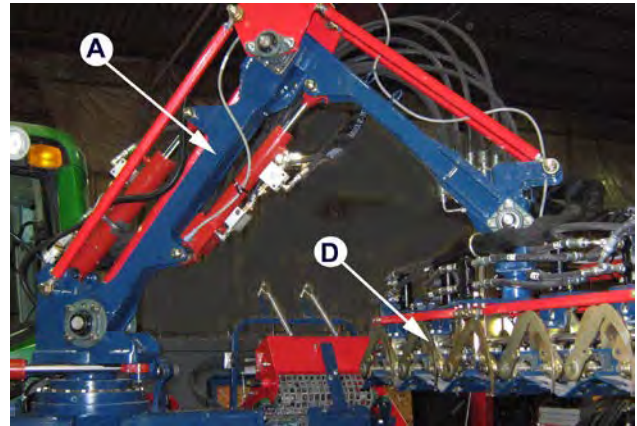
Pallet Lift Forks

The Controller is programmed to position the forks automatically, determined by the position of the Sliding Sensor on the Sensor Rail.

- 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.
- At the lowest position it senses the Pallet Insert function.

The Sensor Cable is connected to J4 on the front 4- Port Block Connector (F4).

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



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 holds up to 15 pallets for transfer to the Lift Forks.

Pallet placement is controlled by the operator with 'inputs' on the cab control panel. (Controller 'A'). (See Controls Section page 2-07).

Pallet 'transfer' is by hydraulic cylinders. The cylinders are controlled through Controller 'C' and Proximity Sensors. (See Electrical Section 5).

Stowed Position

To reduce the width of the machine when shipping or transporting the Pallet Dispenser Assembly can be 'manually' rotated, from its operating position to its 'stowed' position.



WARNING

Crushing Hazard. To prevent possible personal injury, when changing the Pallet Injector from the Operating to the Stowed position, the machine must be on level ground to prevent the assembly inadvertently swinging closed.



Pallet Dispenser – Operating Position



Pallet Dispenser – 'Stowed Position'.

Pallet Specifications

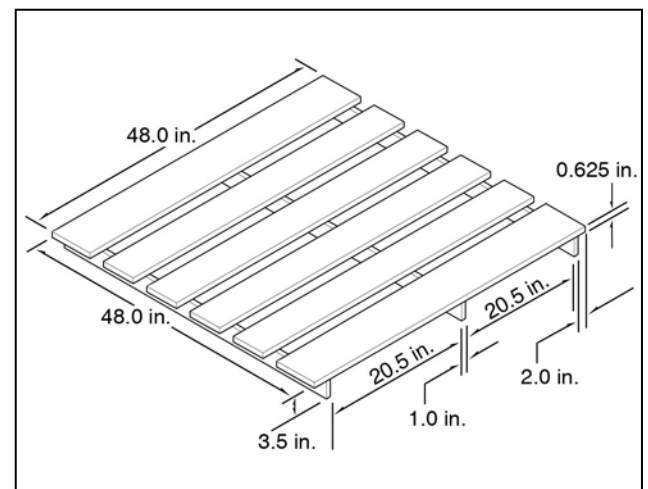
Standard Pallet.

IMPORTANT

To ensure proper operation of the Pallet Dispenser, pallets must conform to the dimensions shown. They must be in good condition, with no loose or damaged boards.

Optional Pallets are available.

Pallets must be able to support 4000 lbs.



Standard Pallet Specifications

OPERATION

Pre-operation and 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 System Power 'ON', Switch 'A'.
- Allow the Hydraulic Pumps to operate and circulate oil through the system.
- Go to 'ACTIVE' Screen.
- Run the Main Conveyor for several minutes to help circulate the oil, until the normal oil operating temperature is indicated on the temperature read-out on the Control Panel Screen.
- Also operate the Arm/Gripper to mimic a stacking procedure. There must be **no rolls** on the Index Conveyor or on the pallet when doing this.



CAUTION

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

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.
- Enable a check to be made for oil leaks.



WARNING

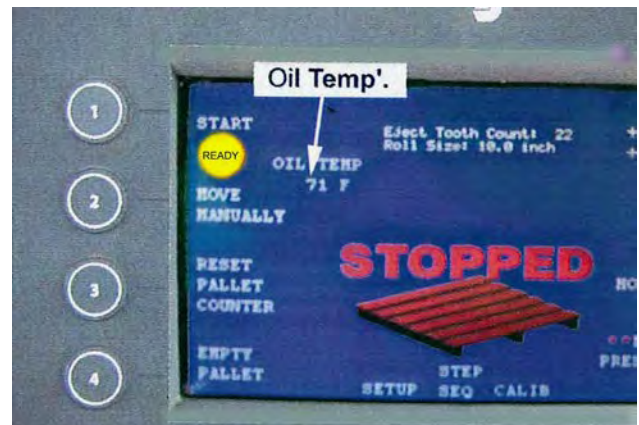
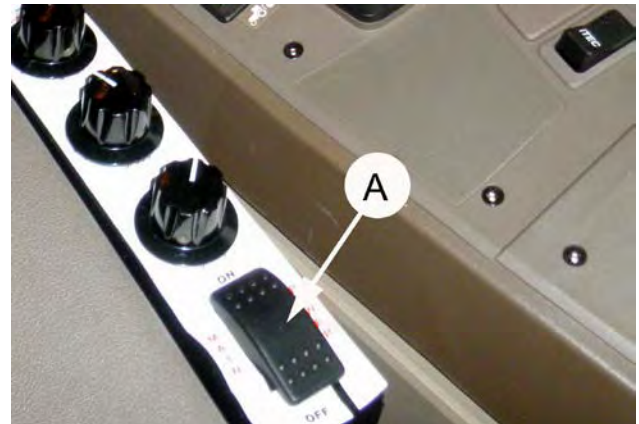
If the Control Valves Manual Control Levers, located behind the cab window, must be used to check the operation of a function during service procedures, **the operator must ensure that all persons are kept well clear of the machine.** Failure to do so could result in serious injury or death.

Arm Pressure Filter.

CAUTION

If during operation 'CHECK ARM PRESSURE FILTER' is displayed on the screen, stop operation immediately. This indicates that the filter **must be serviced**. This warning will only be 'ON' if the oil temperature is above 85deg.F

Failure to follow this instruction will result in damage to the hydraulic components.



Active Screen.



Operating Instructions.

NOTE

Refer to Page 3-01 for the 'Controls Functions' photo Illustrations for clarification.



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.

- Put the F-N-R Lever in '**Neutral**'.
- Depress the clutch pedal and start the engine.
- Select '**A**' Range with Range Shift Lever.
- Select Gear '**4**', using Button on Range Lever, or the Toggle Switch on the Console. (Gear selected is displayed on the Rev. Counter).
- Set RPM at 1500 to 1800 with throttle lever.
Note: RPM limit can be set with control on the console.
- Move F-N-R Lever to '**FORWARD**', then slowly release the Clutch Pedal.

NOTE

Smoother operation is attained using the clutch pedal, rather than the clutch button on the Range Shift Lever.

NOTE

If there is a 'pause' during the engine start pre-setting 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 repeat the engine start procedure.

- Switch Main System to '**ON**'. 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.
- Inject a Pallet onto the forks.
- 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 6.

- Lower the Cutter Head.
- Increase engine speed to 1800 RPM **maximum**, to ensure sufficient hydraulic oil flow.
1800 RPM should be the engine speed when harvesting.
- Start the Cutter/Conveyor operation with the Switch on the Control Handle.
- Adjust the Main Conveyor speed.

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

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

Tooth Count recommended starting point:

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.

To start set the Tooth count at 22 Teeth and adjust as necessary to obtain the correct Roll Flap position.

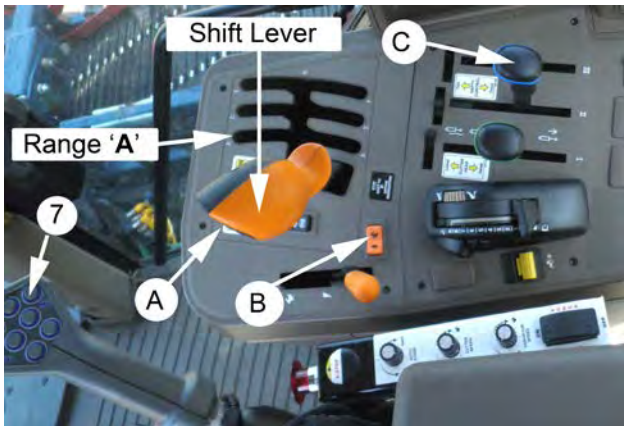
The above settings may require adjustment, depending on prevailing ground conditions.

OPERATION

Transmission Operating Ranges and Gear Selection.

- Use the **Range Selector Lever** and **Gear Select Button 'A'**, to select the recommended transmission configuration, e.g. Range 'A' Gear '4'. **Note:** Gear selection can also be done with the Toggle Switch 'B' on the Console.

Gear selected will show on Rev' Counter. See P3-01.



- Move the F-N-R Lever to the **'forward'** position, then slowly release 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 'C'

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 '7' (Roll Eject)** on the Control Handle. 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 moves **'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 and **hold Pad '7'**, on the Control Handle, this will stop the stacking sequence and prevent the Controller from sensing the ends of the Rolls or Strips. Release Pad '7' to resume harvesting.

Stacking Sequence.

IMPORTANT

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

When the 40, 50, 60, 70 or 80th 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 7th Roll is placed on the Index Conveyor.

Pallet Full and Insert new Pallet.

When in the **Manual Pallet Insert** mode:

After 44, 54, 64, 74 or 84 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 the **Trigger**, on the **Control Handle**. See page 2-02

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.

If necessary the Robotic Arm **must be moved manually**, over the Index Conveyor.

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.

Inactive Stacking Screen.

Push the Trigger on the Control Handle, the Inactive Stacking Screen will appear on the Control Panel.



Inactive Stacking Screen

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' Arrow Pads** to adjust the number of Rolls on the Index Conveyor, indicated by **'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.

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 go to Green **'READY'**, then push the Trigger on the Control Handle to go to **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 recommended procedure below :

- 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'.

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

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 rolls are on the Index Conveyor.

- The diameter of the Rolls, 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' to 'grab' the rolls. This pick-up height is adjusted by selecting the correct roll size on the display screen.
- Selecting a roll size that is 'too small' 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.

MAINTENANCE

Sod End Sensor – Calibration. Field Installation.

Fig.1

'A' – Sensitivity Range Adjustment.
CW = Increase sensitivity.
CCW = Decrease sensitivity.

'B' – LED 'GREEN'. Power 'ON'.

'C' – LED 'YELLOW'. Target 'In Range'.
This must be 'ON' only when sod is passing under the Sensor.

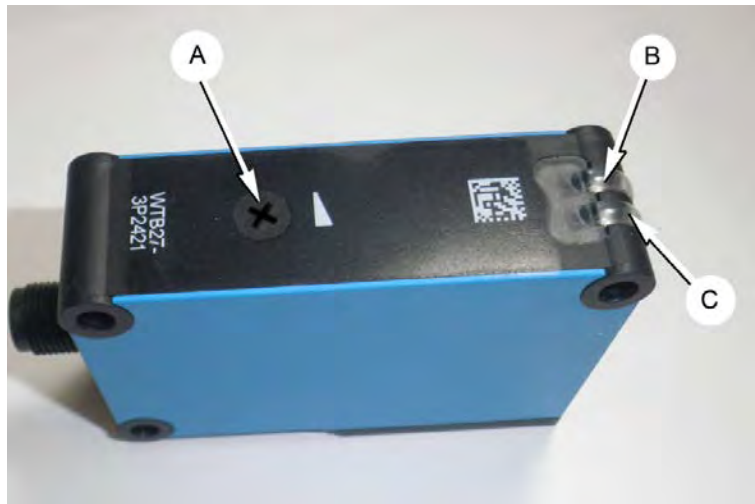


FIG.1

FIG.2

Range adjustment may be required when a new Sensor is installed, or to allow for any change in sod thickness, particularly if the sod being cut is very thin.

- Place a piece of 3/16 in. thick cardboard under the Sensor to act as a target.
- Switch system power (harvesting mode), 'ON'. The 'GREEN' LED should light-up.
- The 'YELLOW' LED will light-up when the Target is detected.
- Remove the Target. The 'YELLOW' LED should not be 'ON'. If the LED remains 'ON', carefully turn the Range Adjuster CCW until the LED does not light-up.

IMPORTANT

If, while the conveyor mat is running with no sod on it, the 'YELLOW' LED **remains 'ON'** or 'flickers **ON-OFF'**, **reduce** the sensitivity until the LED remains 'OFF'.

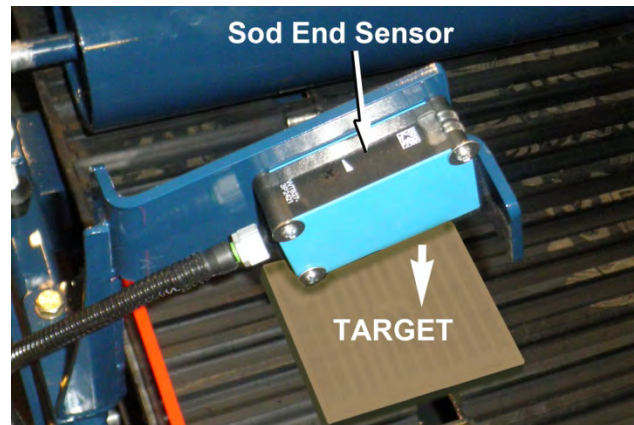


FIG.2

IMPORTANT

To ensure optimum performance the Sensors External Lens, (facing the target), should be cleaned regularly. Also check the cable connection and sensor body attaching screws for tightness. (Do not exceed 1.3Nm).

Roll Flap 'Stabilizer' – Option.

The Roll Flap Stabilizer 'A' holds the sod as it is transferred to the Index Conveyor.
The position of the roll flap is controlled by setting the 'tooth count' as shown on page 3-03.

Adjust the Roll Flap location by loosening the Locknuts 'B' and sliding the flap 'UP' or 'DOWN' to suit the selected position of the roll flap.

NOTE

For Sprocket Type Roll Flap Stabilizer see page 3-03.

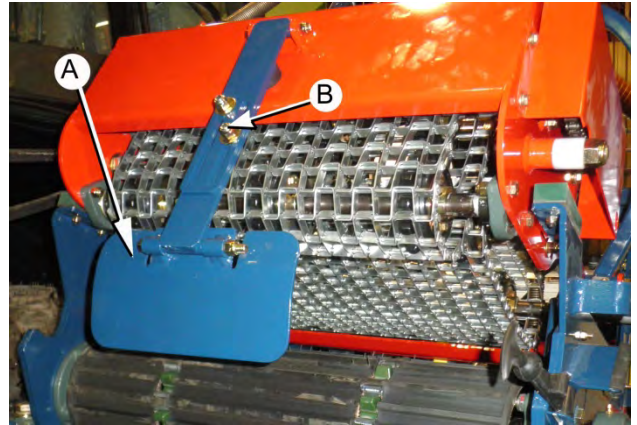
IMPORTANT

Roll Flap must be set to 'just hold' the roll, it must not 'compress' it.



WARNING

Do not attempt to make any adjustments or clear any jammed rolls or debris while the machine is running.

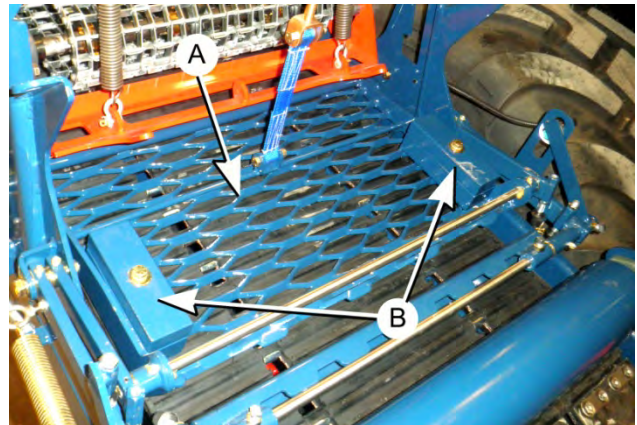


Mesh Starter Tray – Option.

The Mesh Starter Tray 'A' is designed for use when harvesting in 'thin' sod.

The mesh keeps the thin sod from 'curling up' as it approaches the Roll-up Conveyor.

In certain conditions additional weight may be required and weights 'B' can be fitted.



Front Roller – Option.

The Front Roller option is recommended for use when harvesting in soft or peat like conditions.


The Roller is controlled with 'shock absorber' action that increases float and helps maintain the set depth of cut.

Easy to detach for changing field conditions it is virtually maintenance free.



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Maintenance.

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Maintenance Procedures.	DAILY	After first 25 hours	Every 50 hours	Every 100 hours
ENGINE. Important: Refer to the tractor manufacturers manual for full maintenance/service instructions.				
Check/Top-off Engine Oil Level.	X	Refer to the Tractor Manual for: Air Cleaner Pre-cleaner; Air Cleaner Element, Engine Oil and Filter change. Battery maintenance. Check Hydraulic oil		
Check/Top-off Engine Coolant Level.	X			
Check for Water/Oil Leaks.	X			
Clean Air Intake Screen.	X			
Clean Radiator Cooling Fins.	X			
Check and top-off Battery.				X
HYDRAULIC SYSTEM.	X			
Check for Oil Leaks.				
Top-off Hydraulic Oil Level.				A/R
Change Hydraulic Oil.	After the first 500 hours of operation, then every 2000 hours, or annually. (After winter storage). See P4-02 for recommended oils.			
Main In-Tank Filter. Tractor Hydraulics In-Line Filter. Arm In-Line Filter. Oil Tank – Filler/Breather.	See page 4-03. See page 4-03. See page 4-02. Replace Breather Cap – Every six months.			
<div> WARNING</div> <div>To avoid harm to personnel and equipment, the Robo Arm Slewing Ring attaching bolts must be checked for tightness every 500 hrs, or every six months. Torque to 100 ft/lbs. Refer to Page 4-25 for tightening sequence.</div>				
MACHINE				
Check all Fasteners and Fittings.		X		X
Check and oil, Chains and Sprockets.	X			
Check: Front Tires Pressure. 30 psi. Right Rear. 40 psi. Left Rear. 18 psi.	} X	The left rear and both front tires are liquid filled. A special gauge is required to check the pressure in liquid filled tires. If in doubt, contact your Dealer or Kesmac Engineering.		
Check/Sharpen/Replace-Cutter Blades.		X		
Check/Adjust /Replace-Cutter Drive Belt.	X			
Check Main and Index Conveyor Belts.	X			
Check Conveyor Slides.	X			
Check Lug Nut Torque:	Refer to The Tractor Operator’s Manual			
STORAGE: Maintain Tire Pressures. Remove Battery and Maintain Charge. Grease Hydraulic Cylinder Rods.				

MAINTENANCE

Hydraulic System.

The Hydraulic System is filled at the factory with **PETRO-CAN HYDREX XV - All Season Hydraulic Oil**, a premium performance, long life, anti-wear hydraulic fluid,

IMPORTANT

Use only a recommended oils. Failure to do so will result in damage to the hydraulic system.
If **HYDREX XV** is not available, some compatible oils are shown in the list opposite.

The Hydraulic Pumps, Main 'A1', & Auxiliary 'A2', are engine driven.

The Main Pump supplies oil to the 4 & 5 Bank Control Valves. See Hydraulic Schematics pages 4-06/4-07.

The Auxiliary Pump sends oil to the 7-Bank Control Valves for the Robo Control Arm. See Hydraulic Schematics pages 4-05/06.

Internal tractor hydraulics operate the: Cutter Motor, Conveyor Lift, and Depth Control.
An In-line Filter is fitted in the tractor 'power beyond' return line. See page 4-03

The Hydraulic Oil Tank 'B', contains hydraulic oil for the external hydraulics. See page 4-03 for replacement procedure of the Main In-Tank Filter 'C'.
The Filler/Breather Cap 'E' should be replaced every six months.

The Oil Cooler 'D', has a fan that engages when the oil reaches a set temperature, measured by a sending unit in the oil tank. The oil temperature is shown on the Cab Display. (See P3-06).

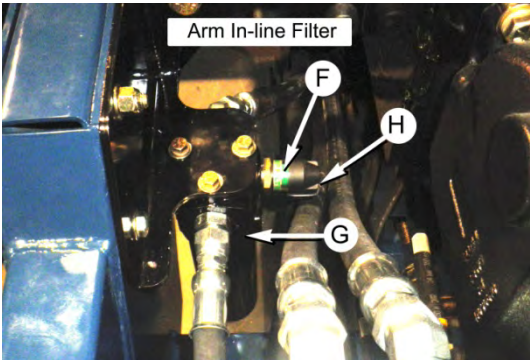
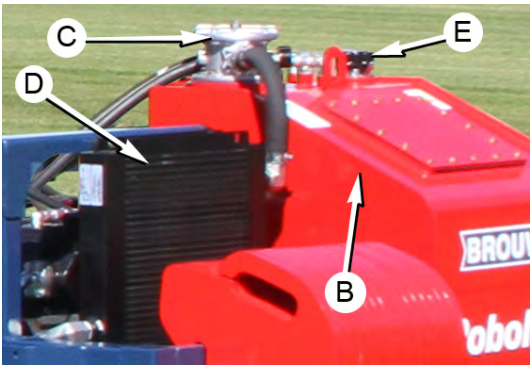
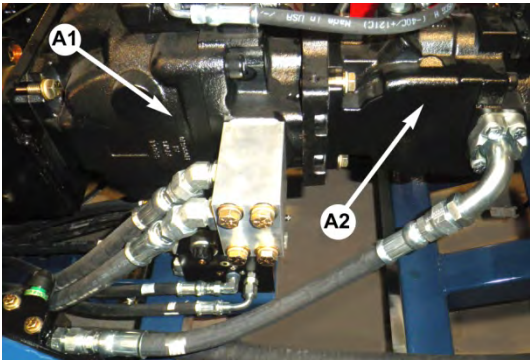
Arm In-Line Filter.

It is recommended that the filter element is changed after the first 750 hrs. of operation. Or, if the filter condition indicator 'F' changes from 'GREEN' to 'RED' the element must be changed **as soon as possible**.
Remove the filter canister 'G' to access the element.
The pressure switch 'H' activates when the indicator goes 'RED', and a **warning** will show on the cab display. (See P3-06).

IMPORTANT

To prevent serious damage to the Hydraulic System do not allow water, dirt, debris or contaminants to enter the system. Pay particular attention when working on the hydraulic tank
When working on/repairing hydraulic components thoroughly clean around the area to be worked on.
Cap and plug all broken connections.

Compatible hydraulic oils		
Conoco Phillips ECOTERRA HV146. This oil is highly recommended		
These oils are also recommended.		
Ambient temperature 0° F.to 90° F. 20° F.to120° F. -18° C to 32° C. -6° C. to 49° C.		
AMSOIL	HV1 46	HVJ 68
MOBIL/ESSO	UNIVIS N46	UNIVIS N68



Hydraulic System.

Main In-Tank Return Filter.

It is recommended that the In-Tank Filter Element is changed **every 750 hours, or if the indicator needle on the Filter Condition Gauge 'A', enters the 'RED' zone, the filter MUST be replaced as soon as possible.**

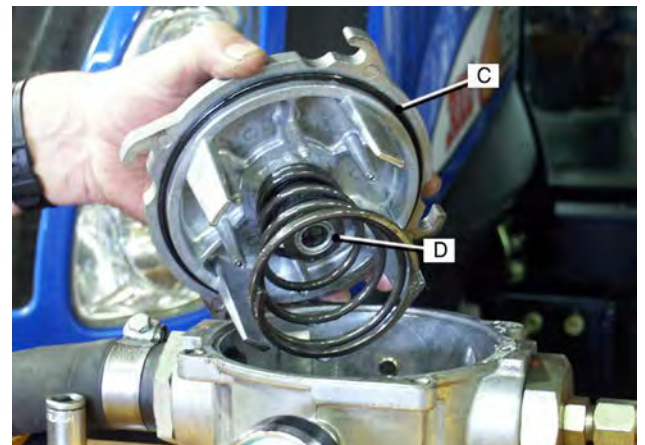
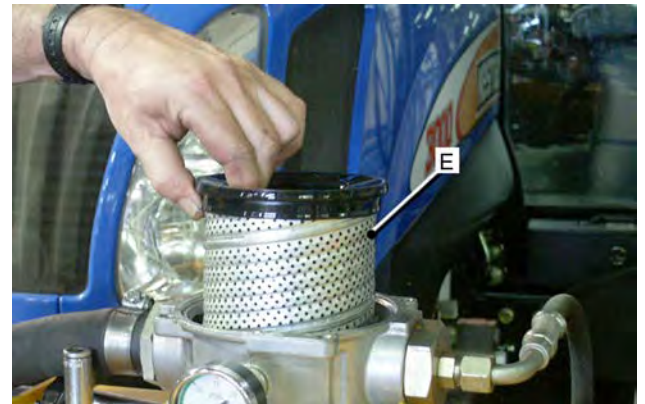
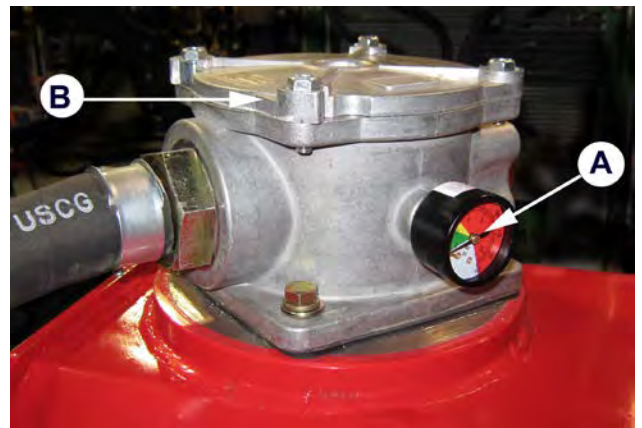
- Before loosening the bolts in the Top Plate 'B', open the Filler Cap to relieve tank pressure.
- Press '**DOWN**' on the Top Plate, against spring pressure, at the same time turn it 'counter clockwise' to remove it.
- It is recommended that a new Top Plate O-Ring 'C' is fitted. Lubricate it before fitting.
- Clean the Magnet 'D' of any metallic residue.
- Remove the used Cartridge 'E' 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.

When changing the Hydraulic Oil (every 750 hours or annually, when the Main Filter is changed):

- Always drain the oil into an approved container.
- Clean and replace the drain plug.
- Refill the tank using only an approved hydraulic oil as shown on page 4-02.
- Fill to the correct level as indicated on the Sight Glass on the oil tank. **Do not overfill.**



Return Line Filter. Tractor Hydraulics.

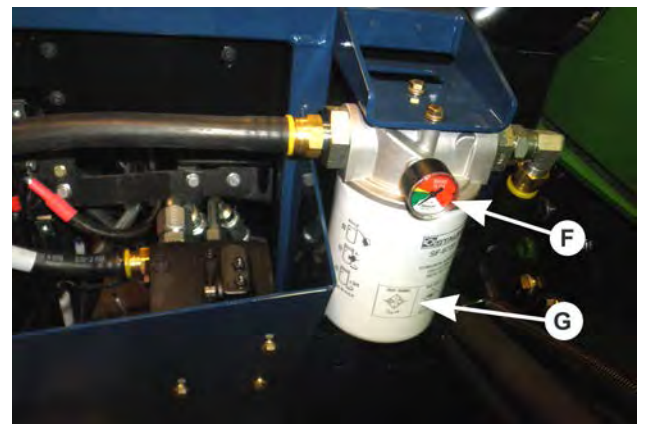
The Return In-Line Filter is in the line from the Cutter Head Control Valve to the tractor hydraulics power-beyond return port.

It is located to the rear of the right hand front wheel.

The filter has a condition indicator gauge 'F' on the filter head.

When the gauge needle enters and remains in the '**RED**' zone, **the filter must be serviced as soon as possible.**

The service instructions are located on the filter body 'G'.



MAINTENANCE

Hydraulic System. PVG. Control Valves.

The Control Valves, located to the rear of the cab window, can be manually operated with the window open.

IMPORTANT

Control Handles on the Control Valves are to be used **only when doing service work**, to enable functions to be checked. **DO NOT use for harvesting operations.**

The Seven Bank Valves control the following functions:

1. Arm Rotate Cylinder.
2. Arm Lift Cylinder.
3. Arm Reach Cylinder.
4. Gripper Rotate Cylinder.
5. Multi Finger Grip Cylinder.
6. Single Grip Finger Grip Cylinder.
7. Squeeze Cylinders.

The 4 & 5 Bank Valves control:

1. Pallet Drop
2. Pallet Load
3. Pallet Rotate.
4. Forks 'UP-DOWN'.
5. Index Conveyor
6. Eject Cylinder.
7. Gate.
8. Cut-Off Motor
9. Conveyor – 'ON'.

Single Control Valve.

10. Cutter Control Valve – No Control Handle
Located on the right hand side of the frame.



CAUTION

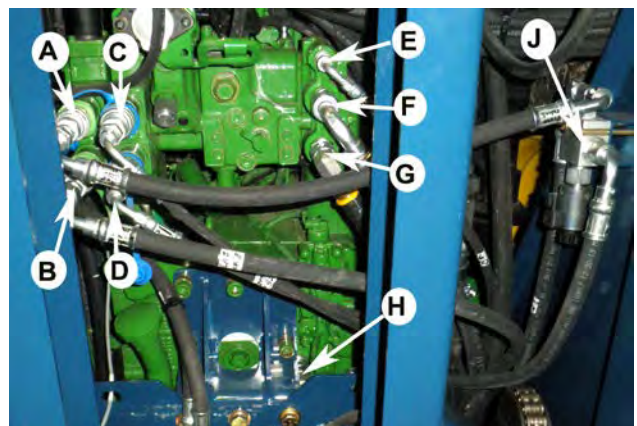
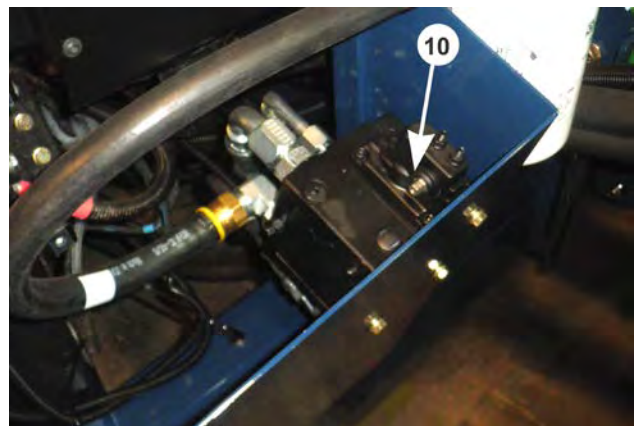
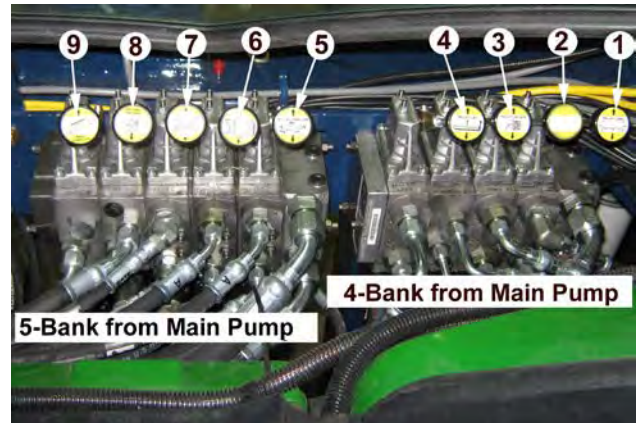
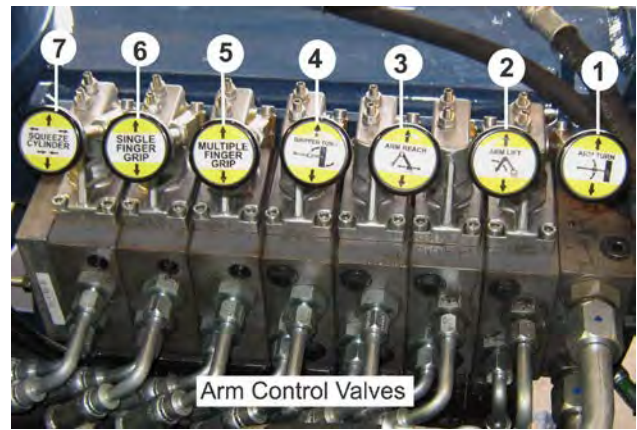
To prevent possible personal injury:

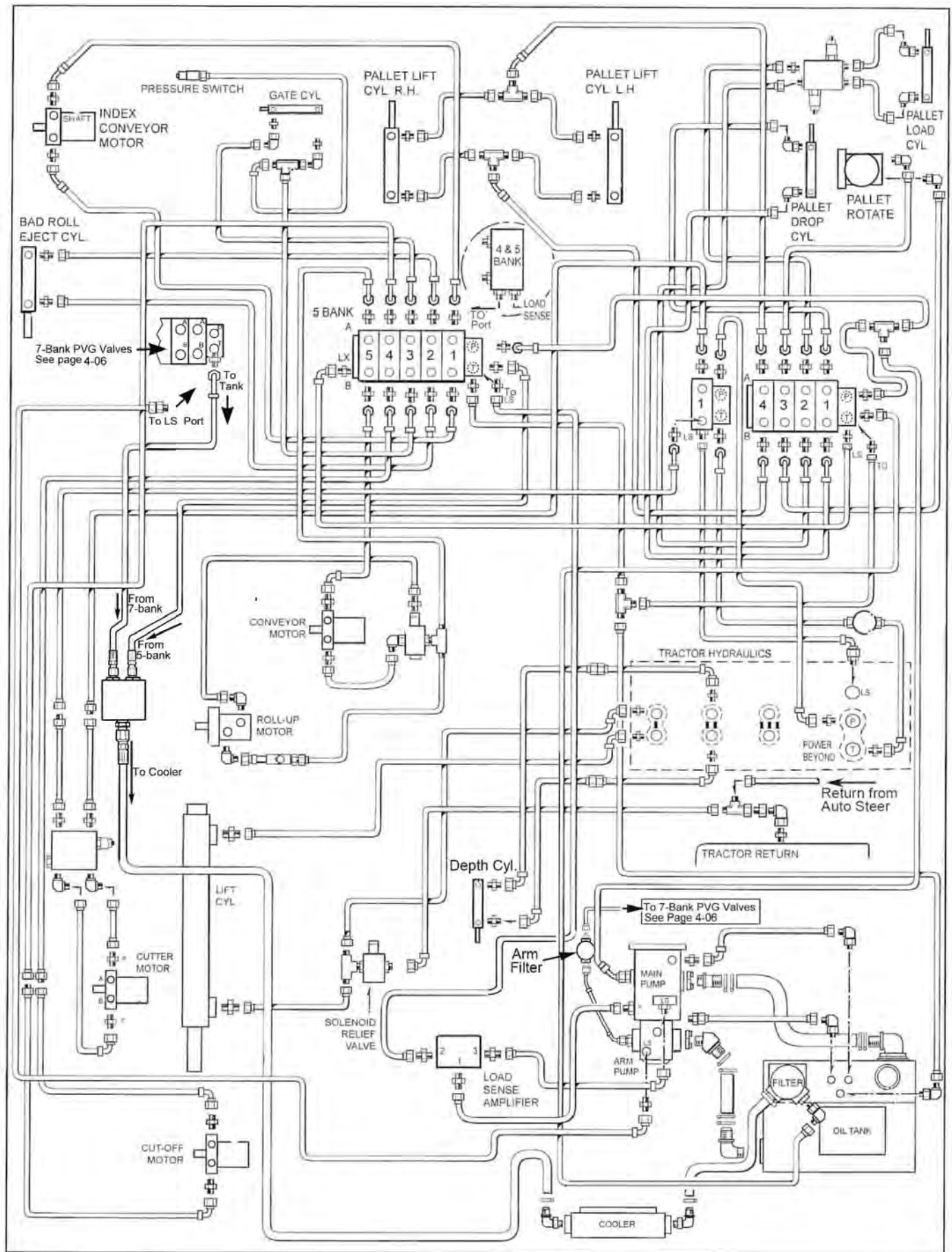
Do not attempt to manually operate this valve

The following functions are powered from the Tractor Hydraulic System.

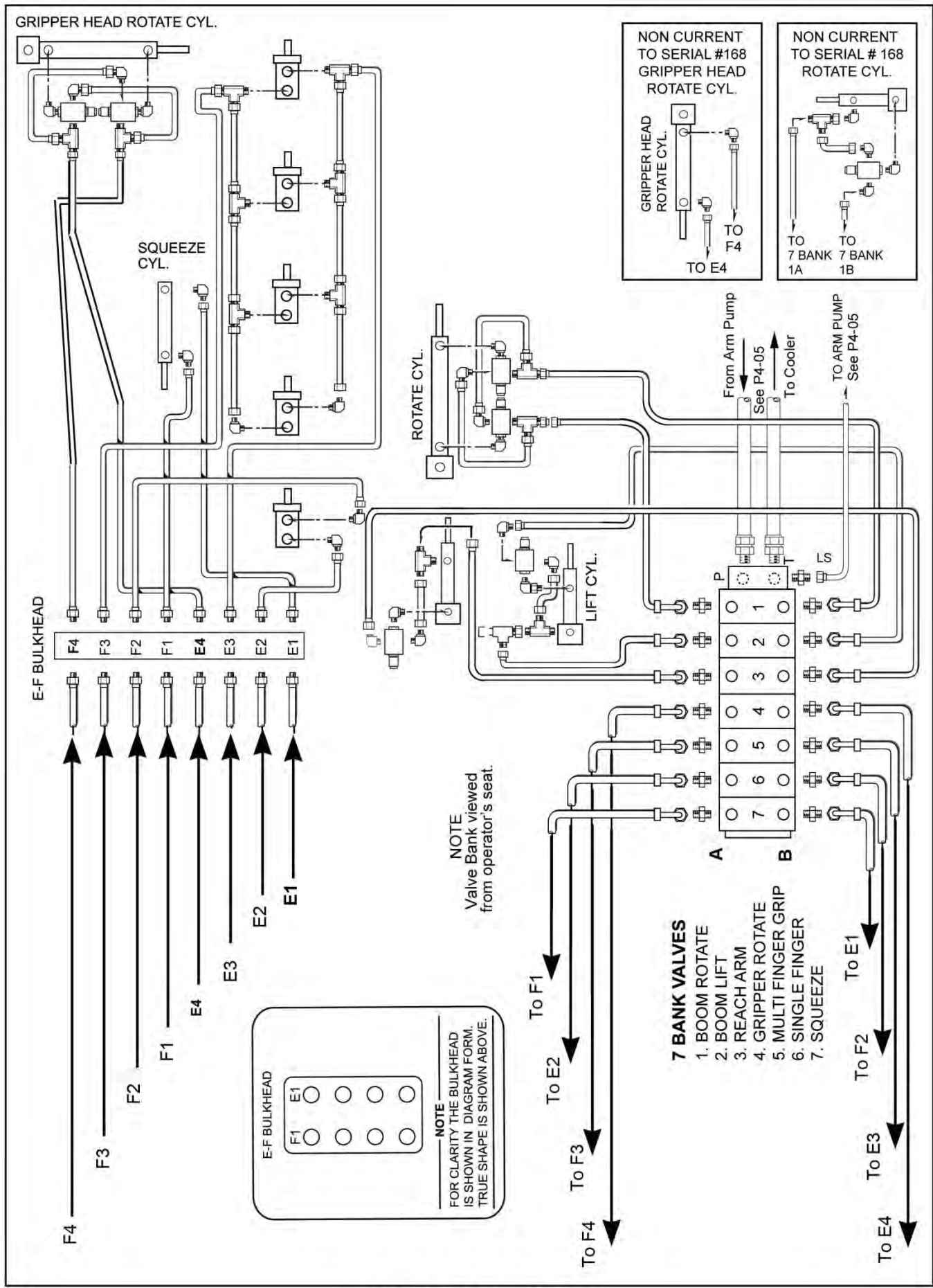
(See Hydraulic System Diagram).

- Port 'A' Conveyor 'DOWN'.
- Port 'B'. Conveyor 'UP'.
- Port 'C' Retract Depth Cylinder. (Increase thickness).
- Port 'D' Extend Depth Cylinder. (Decrease thickness).
- Port 'E'. Load Sense to Cutter Control Valve.
- Port 'F'. Pressure to Cutter Control Valve.
- Port 'G'. Return from Cutter Control Valve.
- Port 'H'. Return from Lift Cylinder Solenoid Relief Valve 'J', and Auto Steer Valve Block.





Hydraulic Schematic. Sheet 1.



RoboMax *JD*. Hydraulic System.

Hydraulic system pressure test ports.

The pressure test ports are used when setting pressures in the hydraulic system, e.g. after installing a new high pressure pump.
Also when diagnosing malfunctions in the system.

NOTE

If these test ports are not on a machine, it is recommended they be obtained from the factory and installed to enable safe and easy test procedures to be carried out.

Fig.1

- **Test Port 'A'. Main Hydraulic Pump.**

Test Port 'A', Part No. KH00184.

'T' Fitting, Part No. 444070432.

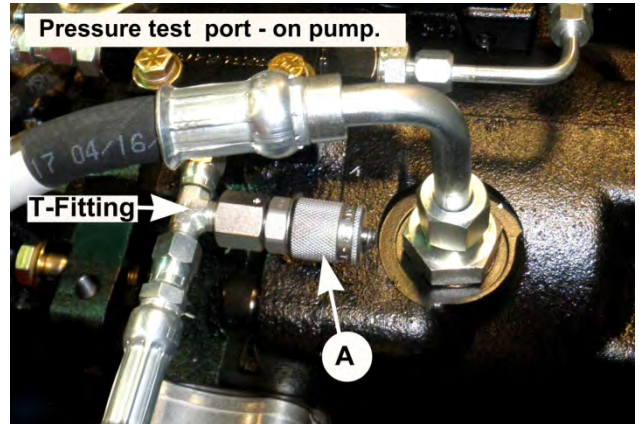


Fig.1

Fig.2

- **Test port 'B' on the 7-Bank PVG Valves.**
(There is no test port on the Aux. Pump).
Test Port 'B', Part No. KH00181.
No 'T' fitting required.

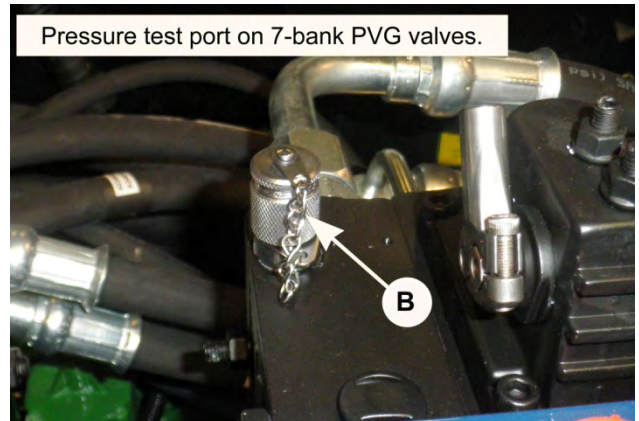


Fig.2

Fig.3

IMPORTANT

The correct gauges, e.g. 1000 psi. and 5000 psi. Adaptors and Hose should be used.

The Gauges, Adaptors and pictured are available from the factory. (Part numbers shown).

Using these tools ensures a safe and efficient method for this procedure.



CAUTION

Failure to use the correct/recommended equipment may result in personal injury and/or equipment damage.

NOTE

See following page for pressure setting procedure.

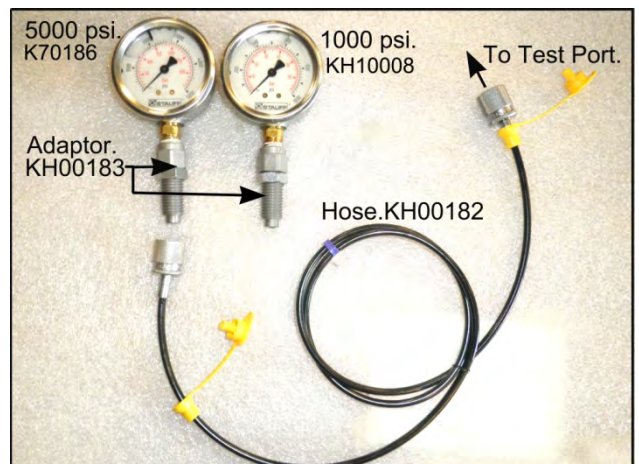


Fig.3

Main Pump – Pressures adjustment.

Fig.4

Load Sense Pressure.

Connect the 1000 psi. pressure gauge at 'C'. Set the engine to 1700 rpm. Gauge reading should be **395 psi**.

To adjust the pressure :

- Release the lock-screw on the Load Sense Port by turning the Allen Key 'A' CCW.
- To **increase** pressure - turn Allen Key 'B' CW.
To **decrease** pressure - turn it CCW
- Tighten the Lock Screw - (do not over-tighten).
- **Disconnect the 1000 psi gauge.**

Bleed the Load Sense line by loosening the fitting at 'F'. Run the engine with the Pallet Lift Forks in the full down position. To prevent stalling increase the engine rpm to 1000. When no air bubbles are seen at the fitting – retighten it. The forks should respond immediately when the line is bled correctly.

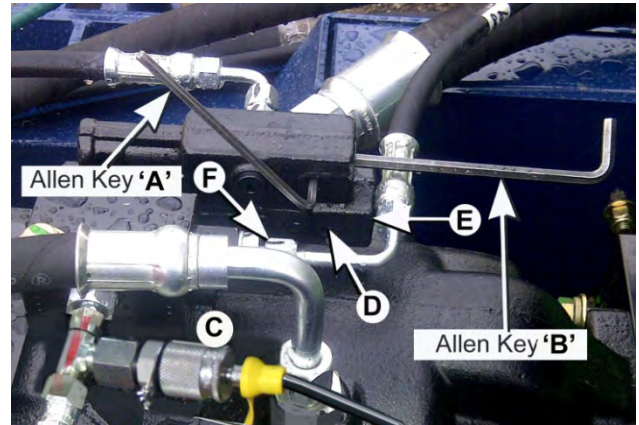


Fig.4

IMPORTANT

Do not activate any function when the 1000 psi. gauge is connected.

NOTE

Allen Keys required are **Metric**
Lock-screws - 4mm.
Adjustment points - 6mm.

Fig.4

Under Load Pressure.

Change the gauge to the 5000 psi unit.

- Reconnect the test hose at 'C'.
- Fit Allen Key 'A' at 'D' and loosen the lock-screw.
- Fit Allen Key 'B' into adjusting point 'E'.
- From the operator's seat activate the Pallet Lift function and lower the forks down until they are 'deadheaded', keep driving them down.
- A second operator should adjust the gauge pressure to **2150 psi**.
- Tighten the lock-screw (do not over-tighten).
- Remove the test equipment

Figs.5/6

Aux. Pump – Pressures Adjustment.

Load Sense Pressure.

- Connect the 1000 psi. pressure gauge to test port 'A' on the 7-Bank valves.
- Set the engine to 1700 rpm.
- The gauge should read **395 psi**.
- Adjust the Load Sense pressure by loosening lock-screw at 'B' and adjusting at adjust point 'C'.
- Tighten the lock-. (Do not over-tighten).
Similar to that shown on main pump in fig.4

Under Load Pressure Adjustment.

- Disconnect the test hose at test port 'A'. Change the gauge to the 5000 psi. unit. Reconnect the test hose.
- From the operator's seat - activate the Gripper Turn function until it is 'deadheaded'.
- A second operator should adjust the Under Load pressure by loosening lock-screw at 'D' and adjusting at adjust point 'E' to **2750 psi**. indicated on the gauge.
- Tighten the lock-screw at 'D'. (Do not over-tighten).
Remove test equipment.

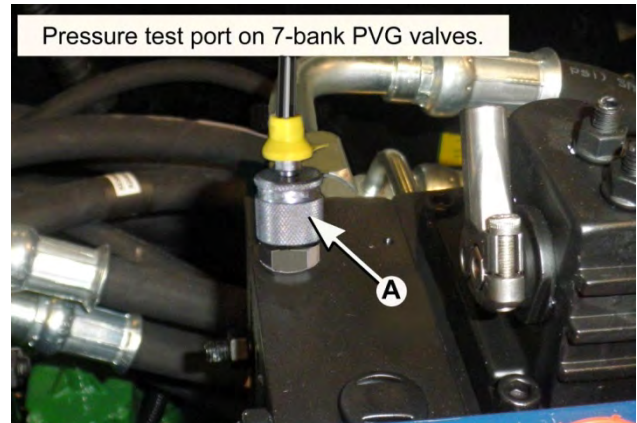


Fig.5

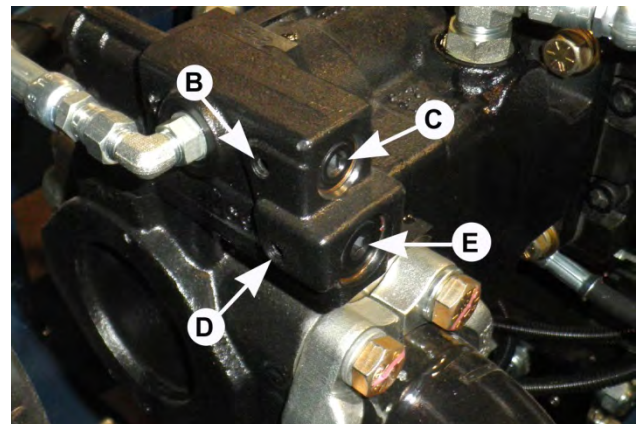
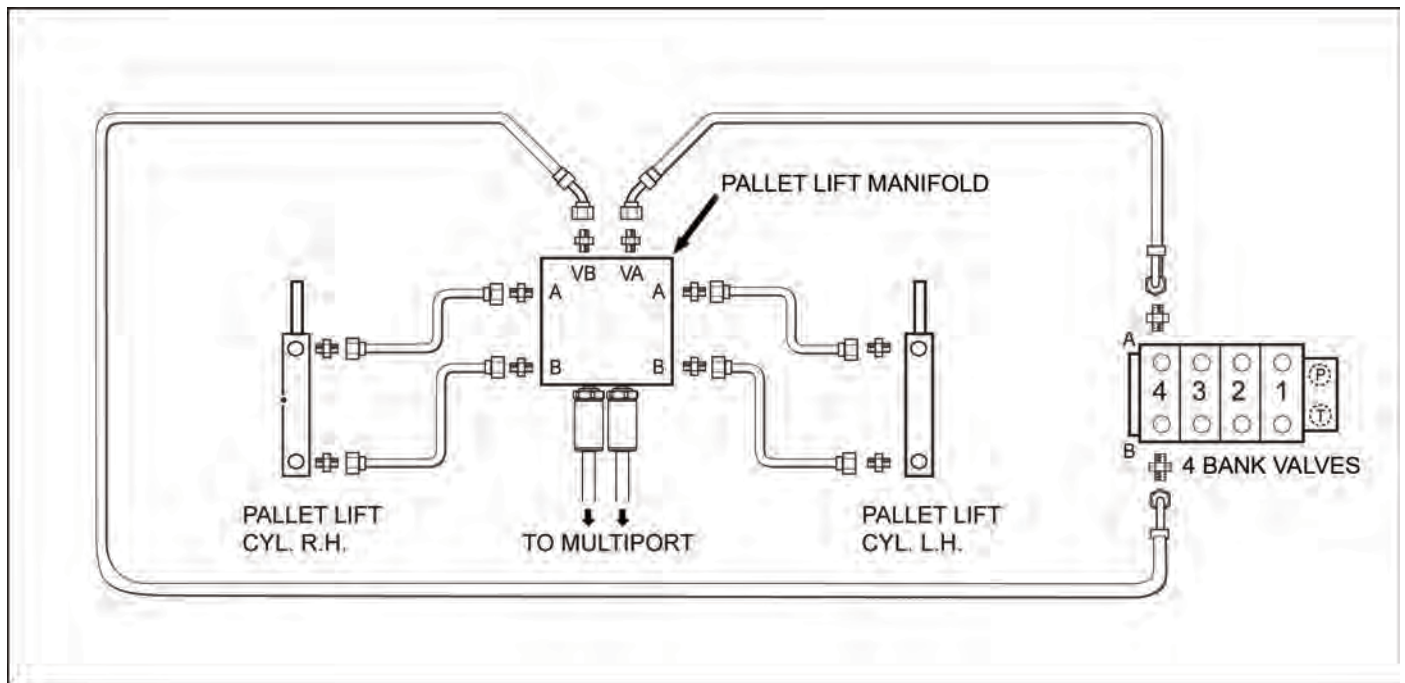


Fig.6

RoboMax *JD*. Optional Pallet Lift Weight Hydraulic Diagram



Cutter Drive Belt Adjustment.

When correctly adjusted there should be $\frac{1}{2}$ inch deflection, at a point midway between the drive and driven pulleys.

Do not over tighten the belt as this will result in premature belt failure and possible damage to the Motor and Eccentric Shaft Bearings.

To adjust the Drive Belt tension:

- Remove the Side Cover to access the Belt 'A', and the Motor Pulley 'B'.
- Loosen the Motor Mounting Bolts 'C', and back-off the Adjusting Bolt Locknut 'D'.
- Turning Adjusting Bolt 'E' 'OUT' pushes the Motor forward and tightens the Drive Belt, turning it 'IN', away from the motor, slackens the belt.
- Tighten all fasteners when adjustment is complete.
- Replace the Side Cover.

Cutter Drive Belt Remove/Replace.

- Proceed as shown above, but turn the Adjusting Bolt 'fully inward', (away from the motor).
- Push the Drive Motor 'back', as far as possible, and remove the Belt from the Drive Motor Pulley.
- Remove the fasteners that attach the Side Arm 'F' to the Cutter Blade.
- Remove the Tie Bolt 'G', and push the Side Arm 'forward', to allow the Connecting Rod 'H' to swing down.
- Release the Bearing Lock Collar 'J', and remove the two Bolts 'K' from the Bearing.
- Slide the Bearing 'out', towards the Connecting Rod. The self centering bearings will allow the Eccentric Shaft to swing down, sufficient to allow the Drive Belt to be removed from the Cutter Head.

Reverse the procedure to install a new Drive Belt. Adjust the belt tension as shown above.

IMPORTANT

The Bolts attaching the Eccentric Shaft Bearings to the Cutter Head Frame must be tightened to 300 ft.lbs.

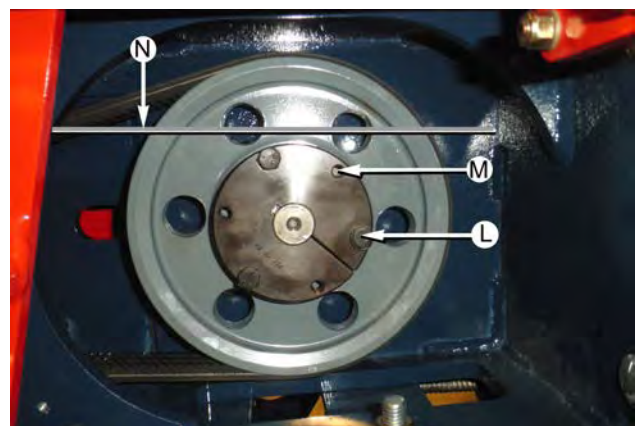
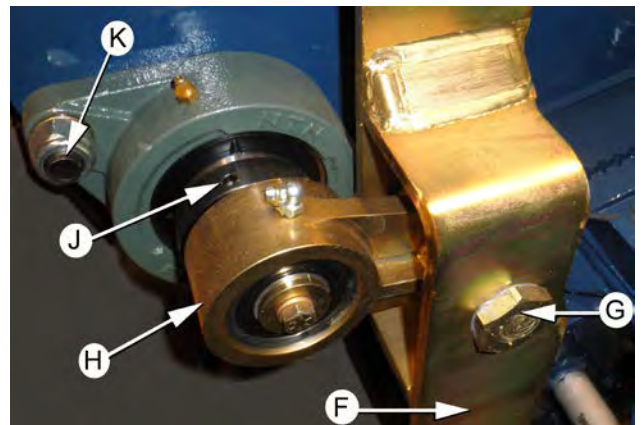
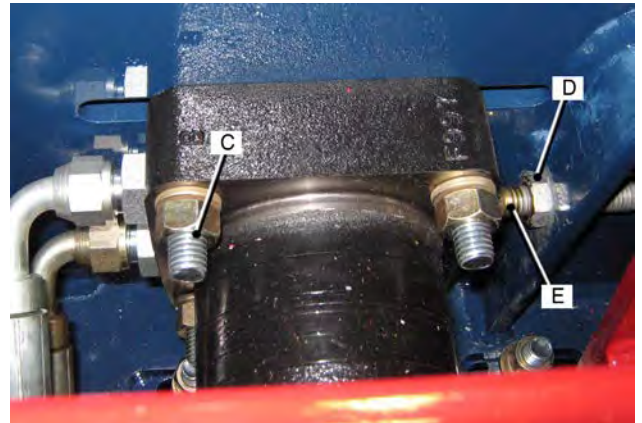
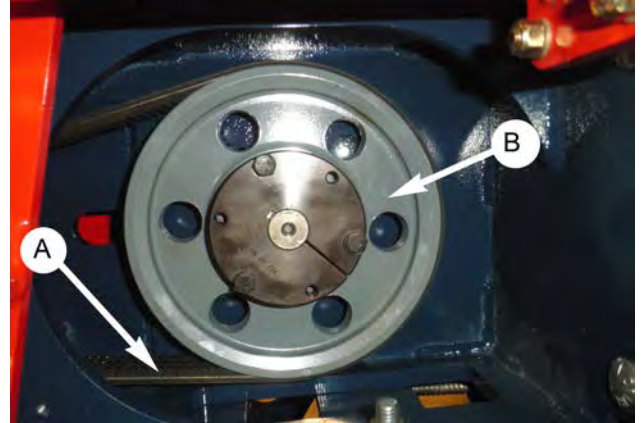
Removing the Cutter Drive Motor :

- Slacken the Drive Belt as shown above.
- Remove the hydraulic fittings from the Motor. Note to which 'port' the hoses connect.
- Remove three bolts 'L' from the Taper Bushing.
- Screw the three bolts 'L' into the three threaded holes 'M'. Tighten the bolts to release the Bushing.
- Remove the Pulley.
- Remove the Motor Mounting Bolts and lift the Motor from the frame.

Reverse the procedure to install a new Drive Motor. Adjust the belt tension as shown above.

IMPORTANT

The Motor Pulley **must be aligned** with the Eccentric Shaft Pulley with a Straight Edge 'N', positioned across the faces of the Sheaves as shown



MAINTENANCE

Adjustments.

Main Conveyor Mat

The Rubber Conveyor Mat has proven to work well in a variety of conditions. It is the preferred choice of most Sod Growers. See page 4-09 for the installation of a new Mat and Metal Clip replacement.

Conveyor Mat Drive

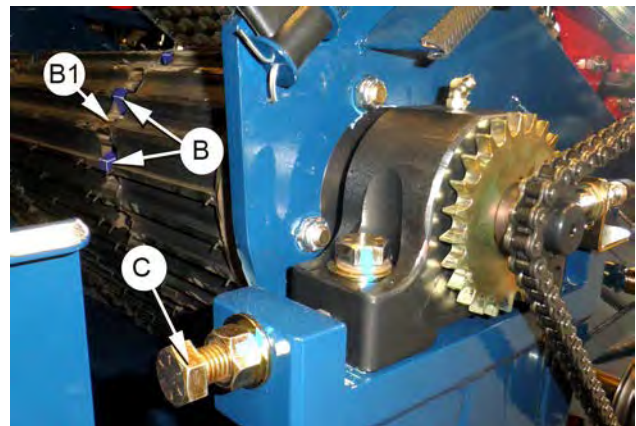
Hydraulic Motor 'A' drives the Mat Sprockets 'B' that run in 'slots' in the mat.

The 'slots' have replaceable Metal Clips 'B1'.

See following page for Mat and Metal Clip replacement.

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

The Bearing Adjustment Bolts 'C', are set at the factory and should only require adjustment if the 'tracking' of the Conveyor, relative to the tractor, is adjusted. (See P4-10).



Crown Roller

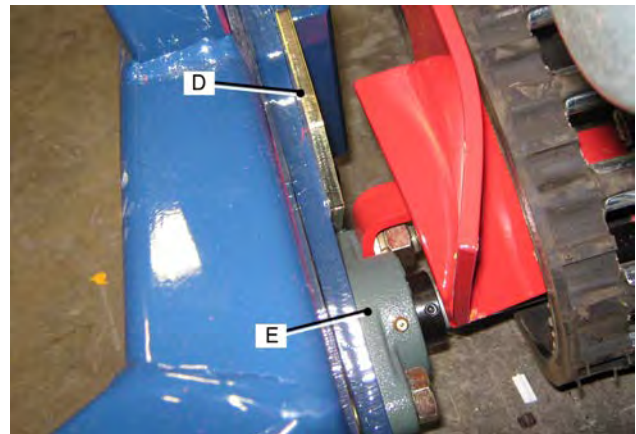
A Crown Roller, at the front of the Conveyor, keeps the Mat 'tracking' square to the conveyor frame.

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

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. 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.



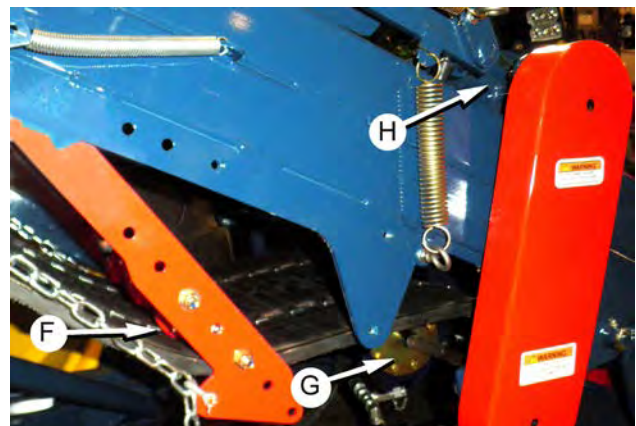
Mat Tension Idler.

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

Chains on the Idler Arms are attached to tension springs. Move the chain links to adjust the tension.

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 'G', supports the Conveyor Mat below the Conveyor Frame. Sprockets on the Idler Shaft drive the 4 inch Roller 'H'.

Main Conveyor Mat.

The Conveyor Mat halves are joined together with rubber joiners. This method eliminates the mat ends having to be overlapped and results in a flat mat join. Metal Mat Splices are still used.

When installing a new mat or new mat sliders a mat join kit must be used. The rubber joiner and metal splices cannot be reused. Refer to the parts manual for kit number

Special tools are available for easy removal and Installation of the mat splices. See below.



Index Conveyor Mat.

The Index Conveyor mat is joined with Metal Splices. The mat halves must be joined overlapped as shown.

It is important that the excess portion of the threaded stud is broken off above the nut

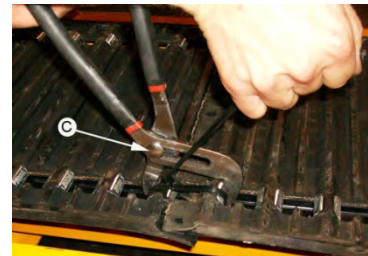
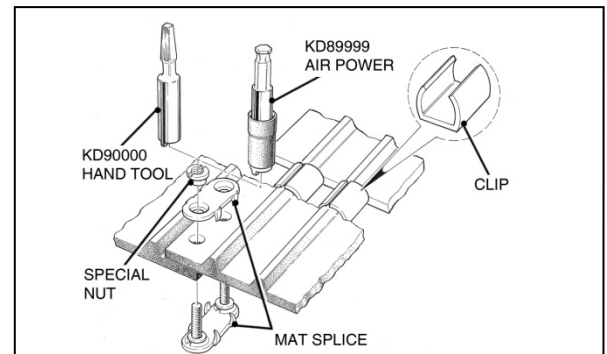
The special tools allow easy removal and installation of the splices.

KD90000 for use with hand tool.

KD89999 for use with air power.

When installing the new mat use expanding grips 'C' to pull the mat ends together, while securing them with zip ties, until the splices have been fitted.

NOTE: A Special Tool is available for mat installation, as Shown. Part No. S500002



WARNING

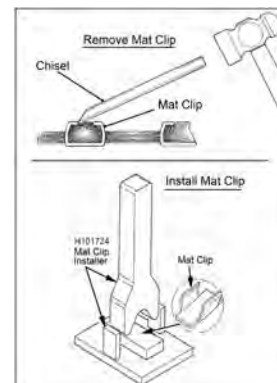
Do not operate the Conveyor until the Stud Ends have been broken off.

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

Mat 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. H101724) is available to make installation fast and safe.



Special Tool. S500002.

Mat Clip –Remove/Fit

MAINTENANCE

Conveyor Mat Installation.

After installing the Conveyor Mat it must be aligned to run 'parallel' in the frame by adjusting the Crown Roller.

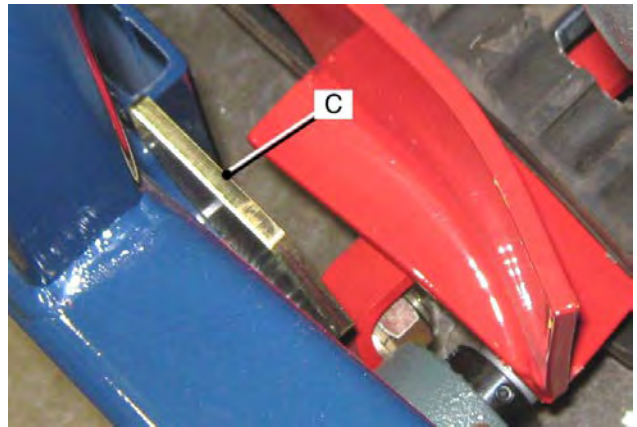
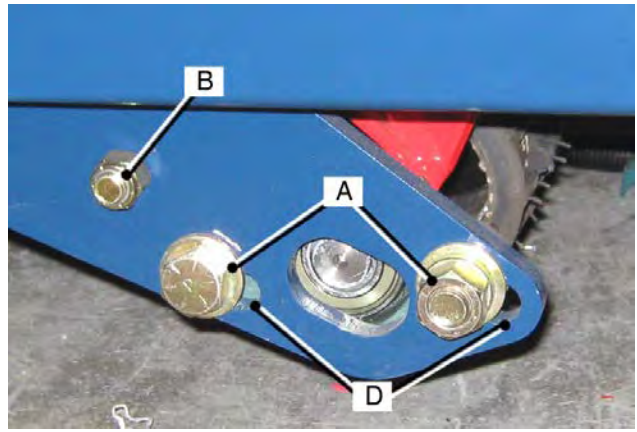
Crown Roller Alignment.



CAUTION

Adjustments **must be done by two people**. One to operate the controls, the second one to make adjustments.

- Loosen the Bearing Bolts 'A' and the Adjusting Wedges Bolts 'B'. Tap the Wedges 'C', 'down' to position the Crown Roller Shaft in the center of the Adjusting Slots 'D'. (on both sides of the frame). To allow for final adjustment do not fully tighten the fasteners.
- 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 '**right**' (to outer side of the frame), tap the '**left side**' Adjusting Wedge 'down'.
- Adjust the Wedges 'C', until the Mat runs parallel to the frame.
- Stop the Conveyor.
- Set the Roller Scraper 1/32 in. from the Crown Roller.
- Tighten all fasteners.



Main Conveyor Tracking.

The Conveyor is set 'parallel' to the tractor with: the bearings at each side at the top of the Conveyor Frame and the Adjustable Bracket 'F' located between two Cam Rollers 'E'. Set a Straight Edge 'G' against the Conveyor Frame 'H' to measure to the tractor frame 'I'.

When set-up correctly there should be 31.25 in.(+/- .25in.) from conveyor to tractor.

The 'tracking' is set-up at the factory and should not need adjusting, except if the Conveyor is removed for service, (or in case of collision).

To set the Conveyor 'parallel' to the tractor :

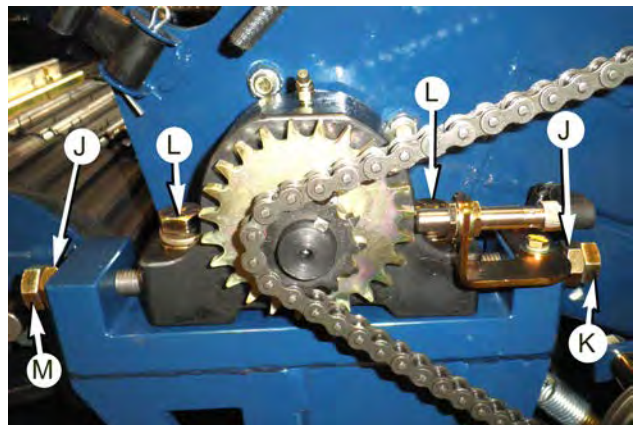
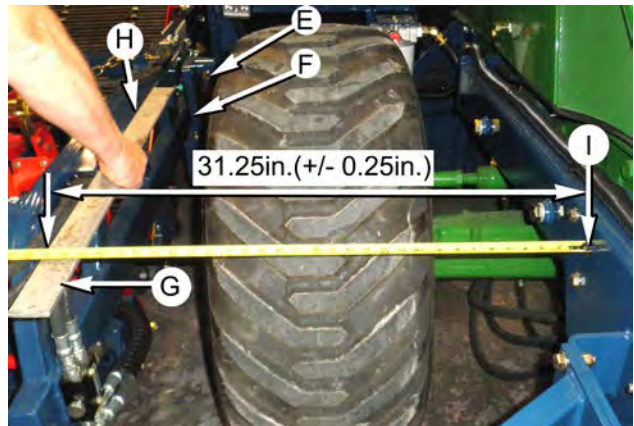


WARNING

To avoid possible serious injury, when the Cutter Head is raised for service, **the Cylinder Safety Lock must be secured** to prevent accidental lowering of the Cutter Head.

Raise the Conveyor until the Ground Roller clears the ground.

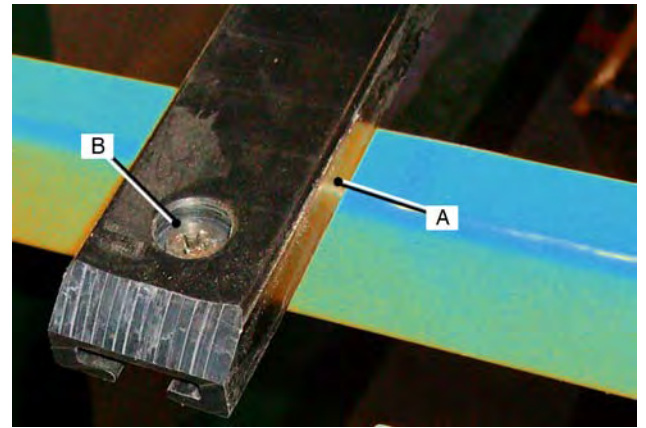
- Loosen the Cam Rollers Adjusting Bracket 'F'
- Loosen Locknuts 'J' and back-off Adjuster Bolts 'K'. Loosen the Bearing Bolts 'L'. (RH. shown).
- Adjust the rear bolts 'M' on **each side** until the correct measurement is obtained, as shown above.
- Re-tighten the Bearing Bolts 'L'.
- Tighten the Bolts 'K', snug against the bearing, and tighten the four Locknuts 'J'.
- Reset and tighten the Cam Roller Bracket 'F'.
- Check the Head 'DOWN' sensor clearance. Page 5-08.



Conveyor Mat Sliders.

The service life of the Conveyor Sliders will vary, depending on the soil conditions. Inspect them for excessive wear, particularly under the Roll-up Tray, when replacing the Mat, and at major service.

The Sliders 'A,' fit onto 'T-Section' Rails and fastened at the lower end with Flat Head S.S. Screws 'B' and Locknuts. Excessive wear will be evident when the rails show through the Sliders. Wear thickness, ($\frac{3}{8}$ inch), is less than the overall thickness.



Remove/Replace Upper Slides.

- Locate a join in the Mat and position it at the mid-point of the Conveyor Frame.
- Remove the Idler Tension Springs, see page 4-08.
- Remove the Mat Splices 'C', see page 4-09.
- Pull the Mat clear of the top Drive Sprockets and off the bottom front Crown Roller.
- Remove the Screws and Locknuts fastening the Sliders to the frame rails, and pull the Sliders up and off the Rails. It may be easier and quicker to cut badly worn Sliders off the Rails. Clean up the Rails for easier fitting of the Sliders.
- Feed the Slider onto the rail, from the top. 'Knock' it down the rail until the bottom fasteners can be fitted.



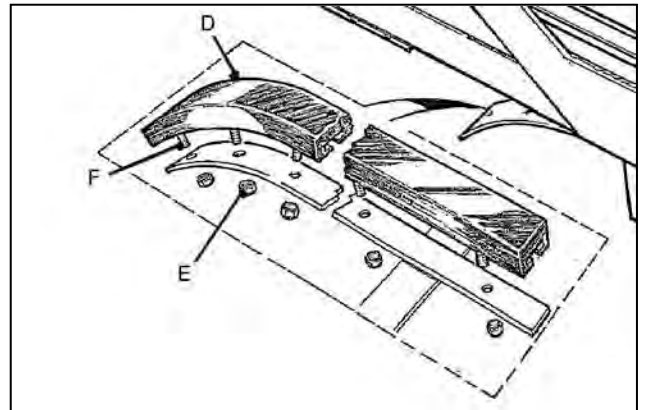
NOTE

Always replace the Sliders as a set.

Lower Sliders.

To replace the Lower Mat Sliders 'D' :

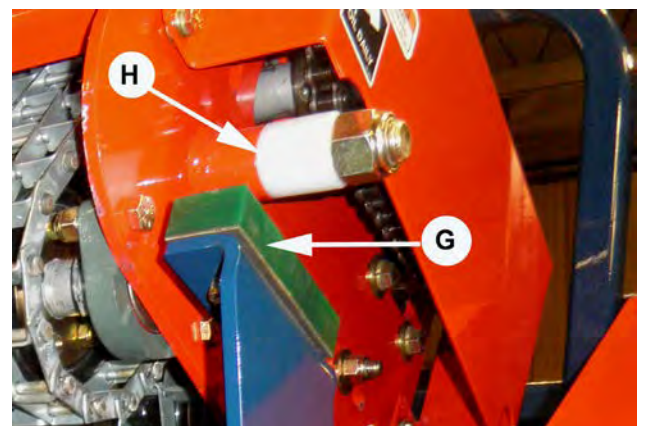
- Remove the five Locknuts 'E', and lift the Sliders off the rails
- Remove 'T-Bolts' 'F', from the Sliders and fit them into the new Sliders, and bolt them into place.



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



MAINTENANCE

Mintex Metal Mats. Roll-Up and Roll Eject.

Roll-Up Mat 'A'. and Eject Mat 'B'.

Replace complete Mats as there are no replacement parts. To ensure a long service life, it is important that the Mat Drive and Driven Shafts, are parallel to each other and set 'square' in the Frame.

NOTE

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

Mat Drive Sprockets.

- The Sprockets are keyed to the shaft and locked with Set Screws.
- The teeth of the Drive Sprockets 'C' **must** contact the Mat Connectors 'D'.
- 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.

Idler Sprockets.

The Idler Sprockets also are keyed and locked with Set Screws. They are positioned one inch closer to the center of the mat than the Drive Sprockets.

NOTE

If the Sprocket Teeth show excessive wear, it is recommended that the Roll-Up Frame Assembly be removed for complete overhaul.

To replace the Roll-Up Mat 'A'.

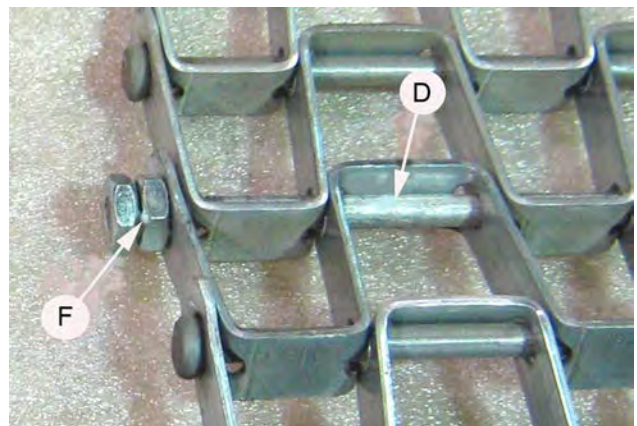
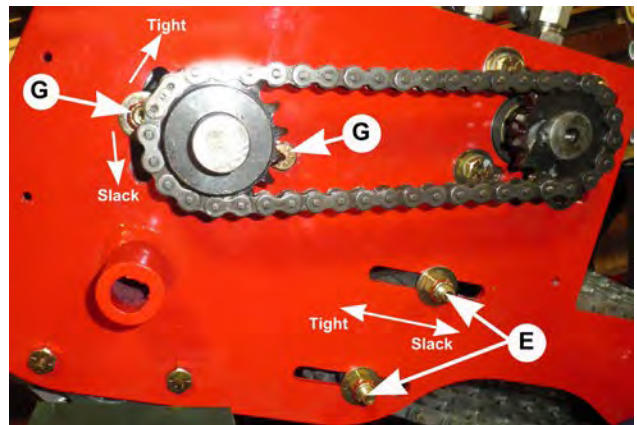
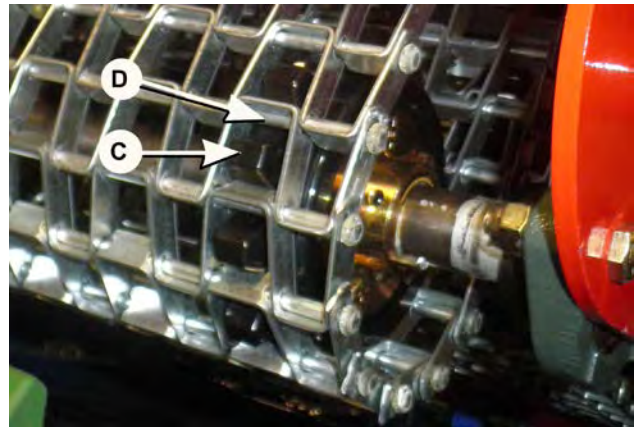
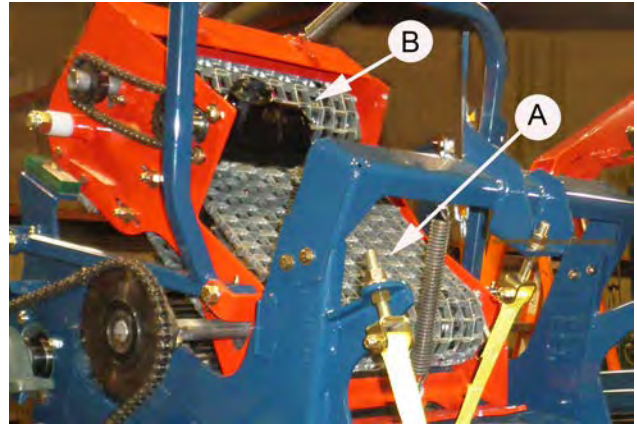
- Loosen the Bearing Bolts 'E', (both sides). Push the bearings 'forward' to slacken the mat.
- Locate the Removable Mat Connector 'D', remove the two Jam Nuts 'F'. Pull the Connector out and remove the mat from the Frame.
- Install the new Mat in reverse order.
- Tighten the Mat by pushing the Bearings back in the Slots in the frame. To ensure that the shaft is square in the frame, measure that the bearings are in the slots 'equally' on both sides of the frame,

IMPORTANT

To prevent premature and excessive wear **do not over tension the Mats**. They should be just 'snug tight'.

To replace the Roll Eject Mat 'B'.

- Loosen the Drive Shaft Bearing Bolts 'G'. (Both Sides).
- Push the shaft 'down' in the slots, to slacken the mat.
- Remove the Locknuts 'F', Mat Connector 'D' and remove the Mat.
- Install the new Mat. Push the Bearings 'up' in the slots to tension the Mat, and tighten the Bearing Bolts.



Index Conveyor Mat.

Sensor Flag Adjustment.

The correct position of the Index Conveyor Roll Cleats 'A', relative to the Main Conveyor 'B', ensures that the Sod Rolls drop onto the Index Conveyor 'between' the Roll Cleats. The positioning of the Roll Cleats is adjustable 'fore and aft', by rotating the Sensor Flag 'C', relative to the Sensor 'D'.

IMPORTANT

When adjusting the Sensor Flag, start with it 'centered' on the face of the Sensor, then rotate it in **small increments** until the correct setting is obtained.

To adjust the position of the Conveyor Cleats :

- Remove the Cover Plate over the Drive Sprocket, Sensor Flag and Sensor.
- Loosen the clamp bolt 'E', in the Sensor Flag Boss.
- Rotate the Sensor Flag 'clockwise' (viewed from 'X'), to move the Cleats 'forward'.
- Rotate the Sensor Flag 'counterclockwise' to move the Cleats 'rearwards'.
- Maintain a Gap of **1/8in.to 1/4in.** between the Sensor and the Sensor Flag.
- Tighten the clamp bolt 'E'.
- When adjustment is complete, replace the Cover.

Index Conveyor. Mat Tension.

To maintain tension in the Conveyor Mat when the Index Conveyor moves from the normal operating position to the 'eject' position, the Link Arms 'F' automatically push back against the Idler Sprocket Arms 'G'.

To increase Mat Tension :

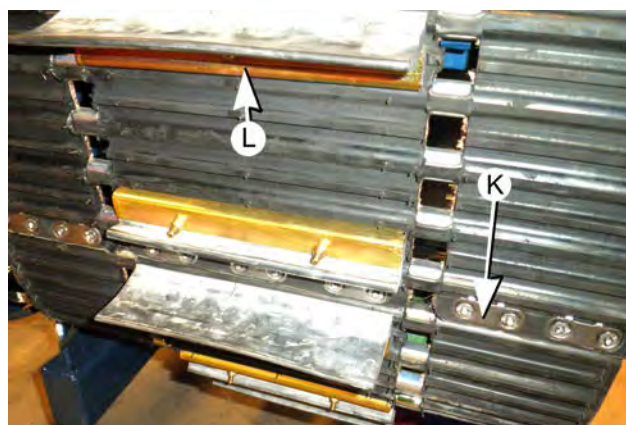
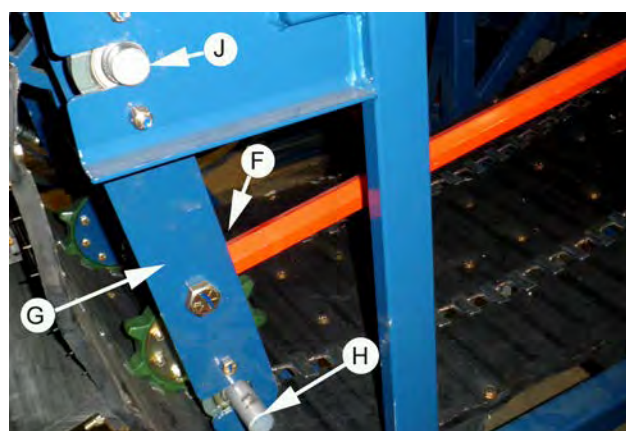
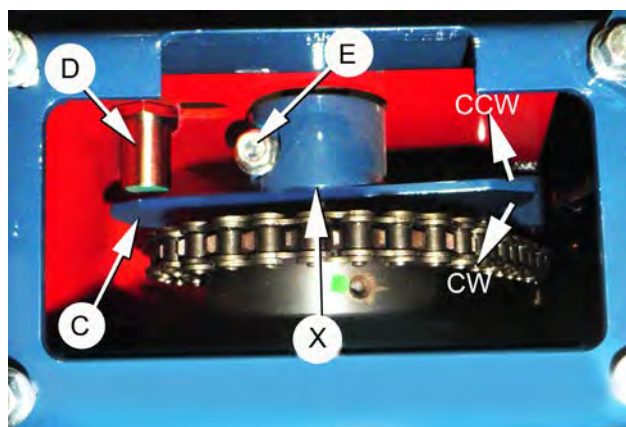
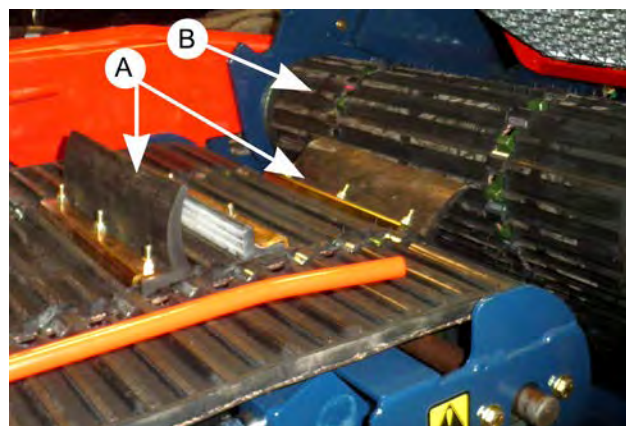
- Loosen Locknuts, (LH and RH thread), at each end of the Link Arms 'F'.
- Turn the Link Arms 'clockwise' to extend them. They **must be adjusted equally** to keep the Idler Shaft 'H' parallel to the Conveyor Drive Shaft 'J'.
- Re-tighten the Locknuts.

To replace the Conveyor Mat :

- Locate the Mat Slice Connectors 'K'.
- See P4-09 for Mat Splice Connector removal and replacement. Remove the mat from the sprockets and out of the conveyor frame.
- Install the new mat in the reverse order.

Mat Cleats :

To replace worn or damaged Mat Cleats remove the Clamp Bar 'L'.



LUBRICATION

Recommended Lubrication Schedule.

It is important that the Recommended Service Schedule is followed. Regular service and cleaning will maintain the machine in good working condition, prolong its working life and reduce repair costs.

Refer to the illustrations on following pages.

See Important Note at bottom of page concerning the Robotic Arm Slewing Ring.

Every 12 hours of operation. (Daily).

Apply light oil to the chains that drive the :

- Main Conveyor
- Roll-Up Mat.
- Roll Eject Mat.
- Pallet Lift.
- Four Inch Roller.

IMPORTANT

Do not apply penetrating oil, e.g **WD40**, to any plastic bushings such as **Igus**, particularly the: **Gripper Guide Blocks**, Index Conveyor Slide Blocks and Pallet Gate Hinges.



Do not use grease to lubricate the chains. It accumulates dirt and result in premature chain wear.

Weekly.

Apply oil to the Pallet Injector Shafts, Linkages and Pivots.

Every 80 hours of operation :

Apply grease gun to all bearings:

(See pages 4-15,4-16 & 4-17 for grease fittings locations).

- Cut-Off Cam.
- Connecting Rods. See Note below.
- Cut-Off Blade Shaft.
- Ground Roller.
- Crown Roller.
- Main Conveyor Drive Shaft and Conveyor Support.
- Four Inch Roller Shaft, Sprocket Drive Shaft, and Pivot Arm.
- Mat Idler Roller Shaft and Idler Arm Pivot.
- Roll-Up Mat Drive and Idler Shafts.
- Eject Mat Drive and Idler Shafts
- Pallet Lift Rollers.
- Gripper Pivots.
- Robo Arm – Reach Cylinder and Turn Cylinder.
- Index Conveyor – Front Idler Shaft and Rear Drive Shaft.
- Index Conveyor Mat Tension Idler Shaft.
- Pallet Injector Pivot Bearings.
- Double Sided Pallet Pivot Bearings; Push Bar Bearings and Retainer Flap Pivots.

IMPORTANT

To prevent damage to the seals in the Connecting Rod Bearings use a hand grease gun. Use of a high pressure gun will 'pop' the seals.

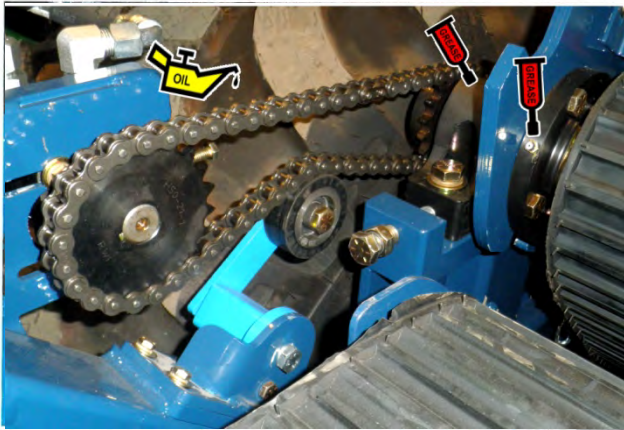
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Refer to Rear Axle Lubrication illustrated on page 4-15.

IMPORTANT

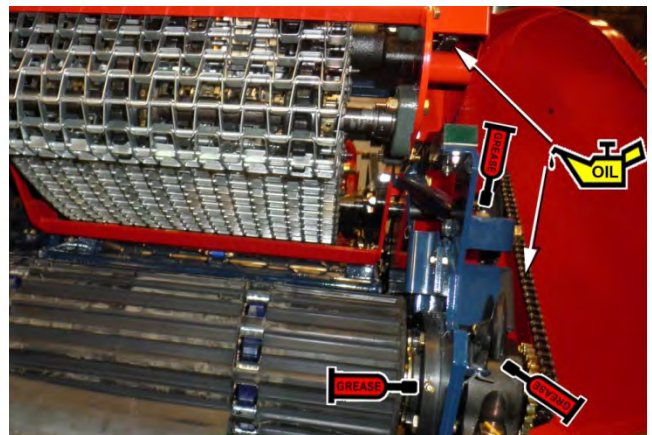
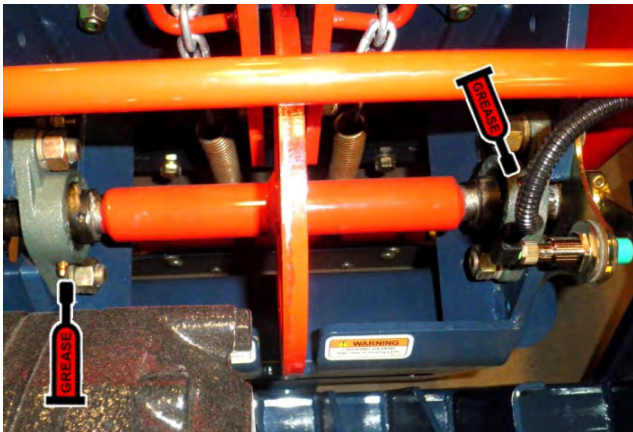
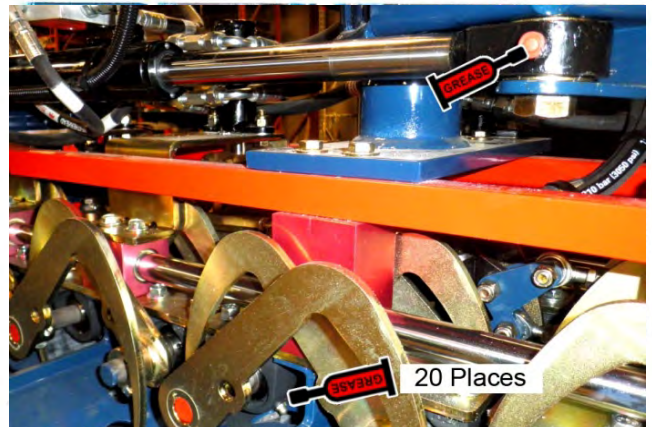
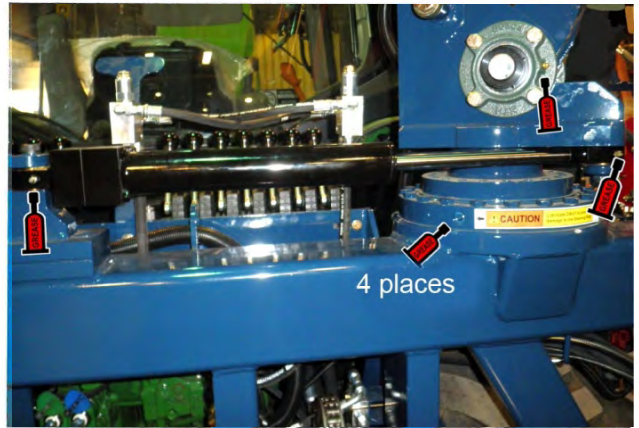
Robotic Arm Slewing Ring.

Refer to pages 17 to 19 for details on lubricating procedure for the Slewing Ring.

To ensure a long operating life on the Slewing Ring it is important to adhere to the lubricating instructions. Also note the '**caution**' concerning pressure washing in the vicinity of the upper grease seal.

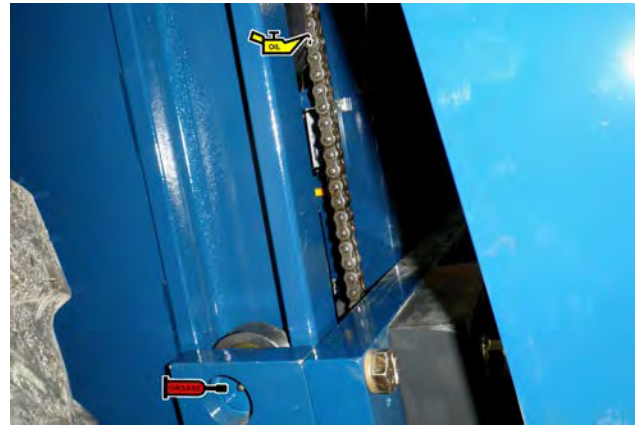
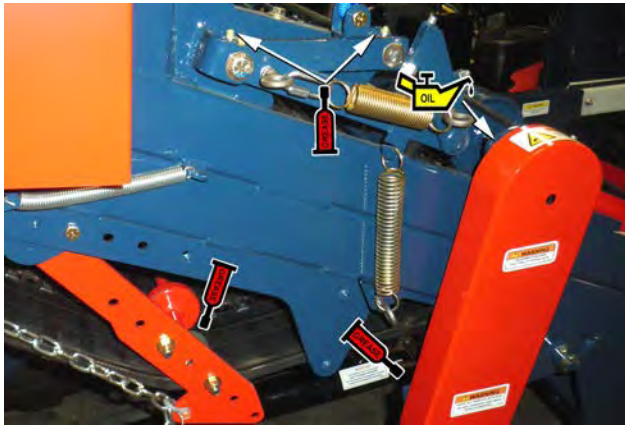


See Pages 4-17/19 for Slewing Ring lube details.

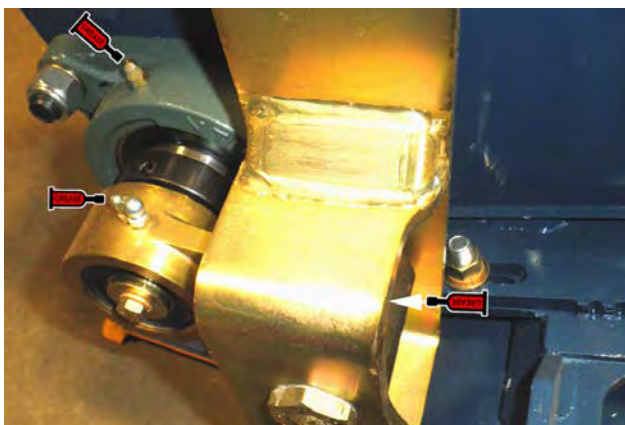
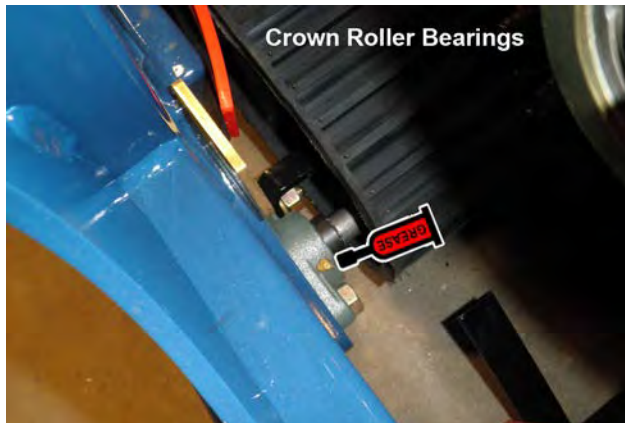
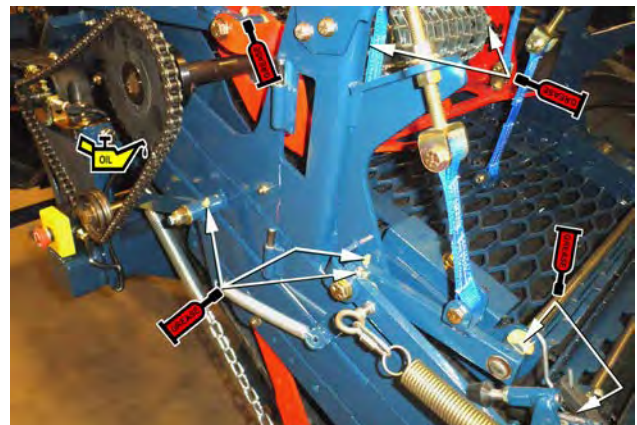
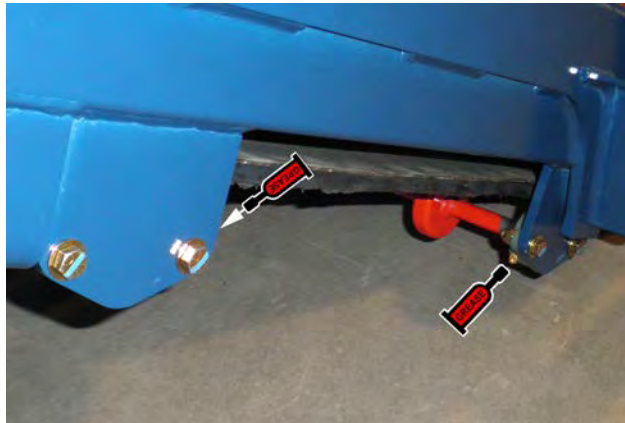


Rear Axle: Every 500 hours apply six to seven strokes of multi- purpose grease to fittings, both sides.

LUBRICATION



Lift Forks Rollers and Chains – Both sides.



To prevent damage to seals – use low pressure gun to the Con Rod Bearings.

Slewing Ring.

IMPORTANT

The recommended lubrication procedure for the Slewing Ring must be followed to ensure the long working life of the unit. The Raceway System is provided with initial lubrication of high quality lithium soap based grease KPN-25 to DIN 1825. The system can be re-lubricated.

Refer to the following pages for details.

Seals.

The Top Seal 'A', and the lower Seal, protect the gap in the Bearing Raceway system from the ingress of dirt, dust, and moisture. Correct lubrication increases the effectiveness of the seals.

IMPORTANT

To prevent damage to the Bearings **DO NOT APPLY PRESSURE WASHER TO THE SEAL AREA OF THE SLEWING RING**

Operating Temperature.

The permissible operating temperature range is:
-13 deg.F to 176 deg.F. (-25 deg.C to 80 deg.C.)

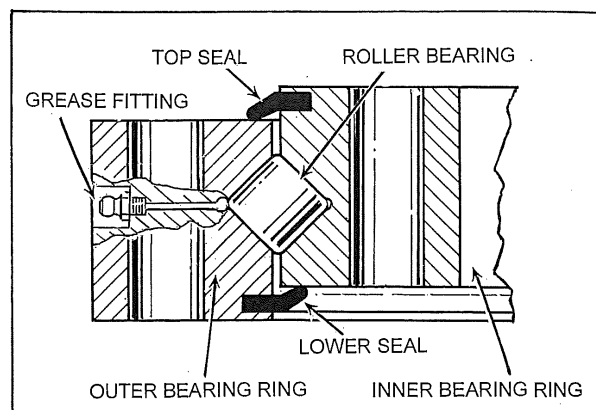
Complete maintenance procedure is continued on the following pages

NOTE

See page 4-25 for the correct tightening sequence when checking the twenty Slewing Ring fastening bolts



Slewing Ring. Lubricate in four places.



LUBRICATION

Slewing Ring.

Lubrication of the raceway system.

Correct lubrication and regular maintenance are important to ensure the long life of the Slewing Ring. The lubricant must perform the following functions:

- It must form sufficient lubricating film at the contact surfaces which is capable of supporting loads.
- It must seal the bearing on the outside (grease lubrication) and thus prevent the ingress of solid and fluid contaminants.
- It must dampen raceway noise
- It must protect the bearing against corrosion.

Grease types.

Data sheets from the lubricant manufacturers provide information for the selection of a suitable lubricant. Important points to be considered when selecting the lubricant:

- Operating temperature range.
- Type of grease.
- Consistency.
- Speed parameter.
- Behavior in the presence of water.
- Pressure properties.
- Miscibility/compatibility.
- Storage life.

Operating temperature range.

The operating temperature range of a grease must cover the range of possible temperatures in the rolling bearing with a sufficient degree of safety.

The possible operating temperatures must not exceed the upper and lower limiting values.

The lubricant should be selected such that the highest possible operating temperature is 20deg.C below the upper limiting value, and the lowest possible operating temperature is 20deg.C above the lower limiting value.

IMPORTANT

The permissible operating temperature for standard catalogue

Slewing rings is: -13deg.F to 176 deg.F. (-25deg.C to 80deg.C).

Consistency.

Lubricating greases are divided into consistency classes. NLGI classes 1, 2 and 3 are recommended for rolling bearings.

Rolling bearing greases which do not soften at high temperatures (NLGI 1), and which do not stiffen up at low temperatures (NLGI 3), should be used.

When selecting the grease, the operating speeds should also be taken into consideration.

Behavior in the presence of water.

Any water in the lubricant has a detrimental effect on the operating life of the bearing.

Pressure properties.

A sufficiently high viscosity at operating temperature must be achieved for the formation of a lubricating film capable of supporting the load.

INA recommends the use of lubricants with EP (extreme pressure) additives and high base oil viscosities.

Miscibility/compatibility.

It is possible to mix greases provided the following preconditions are met:

- Same base oil is used.
- Thickener types must match.
- Similar base oil viscosities (the difference must not be more than one ISO VG class).
- Consistencies must match (NLGI classes).

The lubricant manufacturer should be contacted if there is any doubt.

IMPORTANT

If greases are mixed with each other, the compatibility of the lubricants must always be checked:

- With each other.
- With corrosion protection media or preservatives.
- With plastics (elastomers and duroplastics).
- With light and non-ferrous metals.

Further details are available on request from the manufacturer.

Storage life.

Lubricants age naturally due to environmental influences. It is therefore the user's responsibility to follow the directions given by the lubricant manufacturer.

The greases used in INA Slewing Rings have a mineral oil base and experience has shown that they can be stored for up to 3 years without deteriorating providing the following important conditions are met:

- Closed storage room.
- Temperature between 32deg.F and 104deg.F. (0deg.C and 40deg.C).
- Relative atmospheric humidity 65% or less.
- Security from chemical agents (steams, vapours, fluids).
- Sealed slewing rings.

If slewing rings are stored for longer periods of time, the frictional resistance can be considerably higher than in freshly greased bearings.

The lubricity of the grease may have deteriorated; the bearings should then be re-lubricated.

Slewing Ring.

Initial Grease Lubrication.

INA Slewing Rings are supplied with an initial grease lubrication of a high quality lithium complex soap base grease KPN2N-25 (DIN 51825).

The free space in the raceway system in the bearing is filled with grease. A grease with an operating temperature range of -13deg.F to +302deg.F (-25deg.C to +150 deg.C), is suitable.

Re-lubrication Interval.

Re-lubrication intervals are dependant on :

- Operating conditions.
- Environmental issues such as contamination, water etc.
- The design of the Slewing Ring.

The re-lubrication interval can only be precisely determined by carrying out tests under operating conditions. If comparable results are not available, the guide values shown below can be used.

Values shown are based on the following conditions:

- Operating temperature 158deg.F (70deg.C).
- Circumferential speed 0,5m/s.
- Low to medium loading.

Recommended re-lubrication period.

Heavy contamination, operating in field conditions. Harvesters, Cranes, Diggers. Excavators.	100 to 200 hours.
--	-----------------------------

The raceway system of a slewing ring should always be re-lubricated in the following instances :

- After each cleaning eg. spraying with water, steam etc.
- Before and after long stationary periods, such as inactive winter months, if high levels of moisture occur.

Grease operating life for the raceway system.

If re-lubrication is not possible, the operating life is a decisive factor.

Experience of a large number of applications shows that guide values for the grease operating life can be taken as twice that of the guide value for the re-lubrication interval.

At operating temperatures over 158deg. F (70deg.C), both the re-lubrication interval and the grease operating life are reduced.

In order to ensure operational safety, the grease operating life should not exceed 3 years.

IMPORTANT

When using a pressure washer do not allow the water jet to be pointed at the Slewing Ring seals. The high pressure water will force dust, dirt and contaminants past the seals and into the raceway. This will result in premature failure of the bearings in the raceway system.

Raceway System.

Re-lubrication procedure.

Contaminants such as dirt, dust, spray water and contaminants are forced out by the re-lubrication procedure.

- It is preferred that the same lubrication as used for the initial operation should be used for re-lubrication.
- Re-lubrication should always be carried out while the slewing ring is warm from operation.
- Clean the lubricating grease fittings.
- Press grease into the lubricating grease fittings in turn, until a collar of fresh grease forms all the way around both of the seals (turn one bearing ring slowly during this process).
- The used grease must be able to flow out unhindered.
- Ensure that all feed ducts are full of lubricant before returning the slewing ring to operation.

Lubricants.

Suitable lubricants for the raceway system are shown below.

Depending on operating temperatures, grease with base oils up to ISO VG1500 can be used to improve the lubricating film in the slewing rings which are driven with very high loads and at very low speeds (swivelling operation).

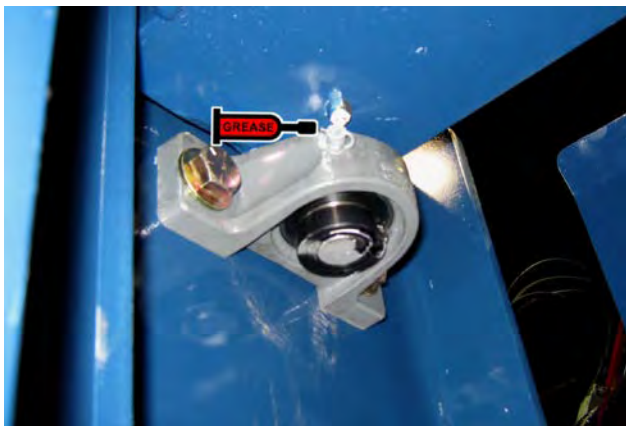
If these conditions occur, contact INA engineering service.

Raceway Lubricant.

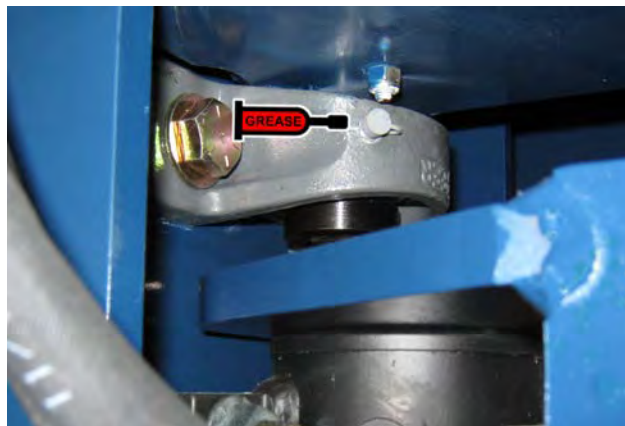
Manufacturer

Aralub HLP2	Aral.
Energrease LS-EP2	BP
Gilssando EP2	DEA
EPEX EP2	ELF
BEACON EP2	ESSO
Centoplex GLP 402	Kluber
Mobilux EP2	Mobil
Alvania EP2	Shell
Retinax LX 2 (INA Designation:SM03)	Shell

LUBRICATION



Pallet Injector. Top Pivot Bearing.



Pallet Injector. Lower Pivot Bearing.

- Regularly lubricate all pivot bushings, catches and links on the Injector System.

Cut Length of Sod

The Wheel Driven Encoder measures the distance traveled, this in conjunction with the Cut-Off Sensor and the programmed 'cut length' determines the length of cut. Maximum cut length of sod is 80 inches. This can be adjusted, to suit sod conditions, to a minimum of 48 inches.

For length of cut adjustment: See Section 2

Cut-Off Blade.

It is essential that the Cut-Off Blade 'B', is kept 'sharp'. As the blade wears, and also when it is sharpened, its depth will be reduced. To compensate for loss of blade depth, holes in the Blade Holder 'C', allow for adjustment. The Blade Holder is tensioned by two springs 'D' that position the blade, when not operating, at 15 degrees from vertical. This allows the blade to swing forward when cutting. The blade angle is set by bending the Spring Attachment Hooks 'E'. Check that the edge of the Cut-Off Blade Mount 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 in these conditions.

Cut-Off Springs. Tension Adjustment.

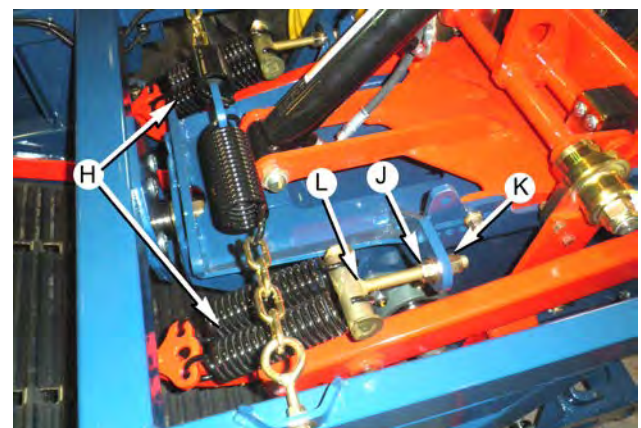
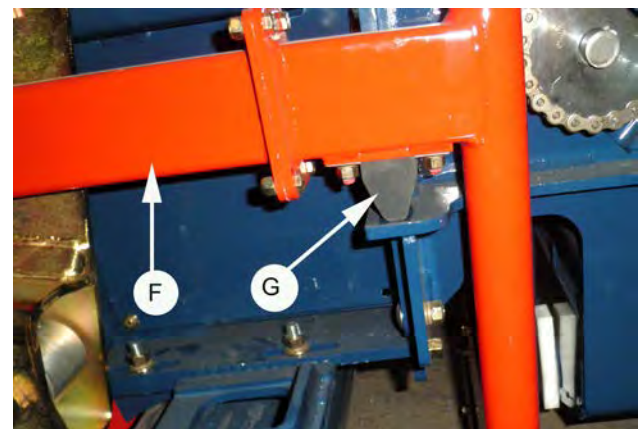
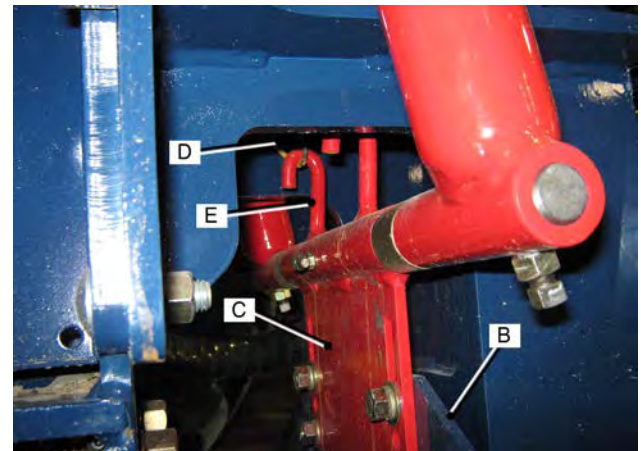
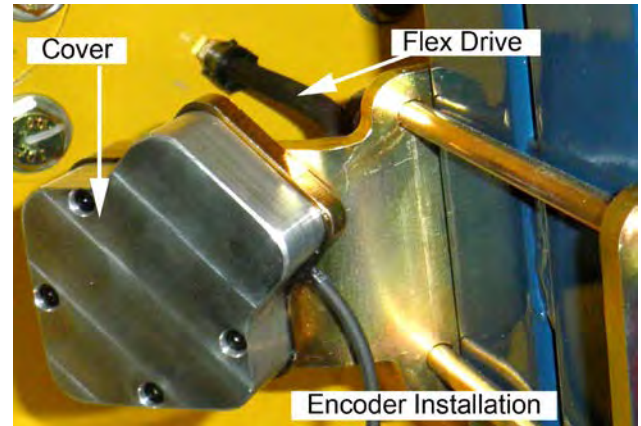
NOTE

There should be only 'light' contact between the Cut-Off Frame 'F', and the 'Bump' Stops 'G', excessive pressure will cause the frame to 'bounce' on the Stops, resulting in premature wear to the bearings in the frame.

Tension on the Cut-Off Springs 'H', is set at the factory, for 'average' cutting conditions. The Cut-Off Blade depth should only be deep enough to give a clean cut, whatever thickness of sod is being cut.

To adjust the Cut-Off Springs:

- Release the Locknuts 'J'.
- Adjust the Nuts 'K' on the Spring Adjusters 'L', until there is just a 'little' tension in the Cut-Off Tension Springs 'H'.
- Turn the adjuster nuts '**Clock-wise**' to **increase** spring tension, and '**Counter-clockwise**', to **decrease** tension.
- Tighten the Locknuts.



ADJUSTMENTS

Pitch Angle.

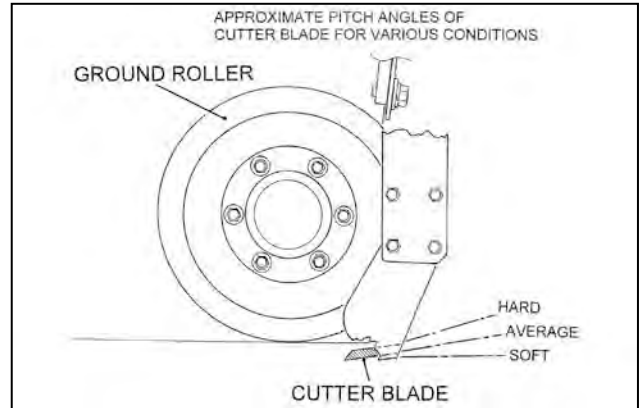
Pitch Angle is the angle that the Cutter Blade makes relative to the ground. It is set at the factory for 'average' turf conditions. Adjustment is provided to improve cutting performance, in soft or in hard soils. In soft conditions the Pitch Angle should put the Cutter Blade almost parallel to the ground. In harder soils the Pitch Angle should be increased to maintain the correct cutting angle and to prevent the Cutter Blade from coming out of the ground.

NOTE

The set-up of the Cutter Blade to the Conveyor Mat and the Ground Roller is important.

An 'extreme' Pitch Angle may require the Ground Roller to be adjusted, to maintain the recommended clearance between the Roller and the Cutter Blade.

Refer to the Ground Roller Adjustment section.



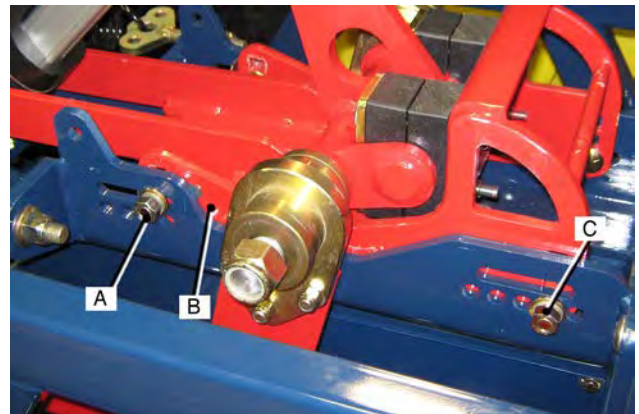
Pitch Angle Setting.

- Loosen the Lock-bolts 'A', in the Adjuster Bracket 'B'
- Remove the Locator Bolts 'C'.
- To set the Pitch Angle for 'Hard' Soil : Pull the Adjuster Bracket **'FORWARD'** to **'increase'** the Cutter Blade Angle.
- To set the Pitch Angle for 'soft' Soil : Push the Adjuster Bracket **'REARWARDS'** to **'decrease'** the Cutter Blade angle.

IMPORTANT

The original Depth Adjustment Holes **must be used** when replacing the Locator Bolts.

- Re-fit and tighten the Locator Bolts 'C'.
- Retighten the Lock-bolts 'A'.



Ground Roller to Cutter Blade Setting.

The Ground Roller compresses the turf ahead of the Cutter Blade.

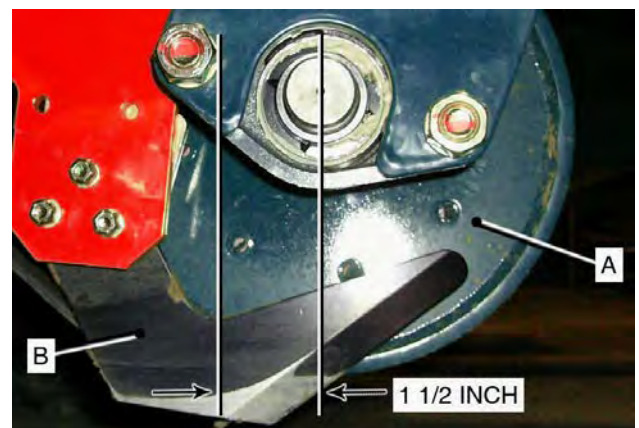
For average conditions the Roller to Cutter Blade setting is 1 ½ inches. This is measured, with the Cutter Blade at its **'full forward'** stroke position, from the center-line of the Ground Roller to the Cutter Blade.

Adjustment is made for various soils to maintain a quality cut.

For example:

- Peat/Muck Soils – Adjust to less than 1½ inches.
- Stoney Ground – Adjust to 2 to 2 ¼ inches.

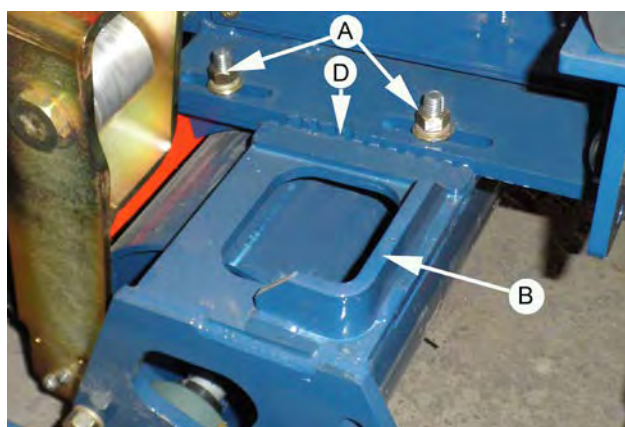
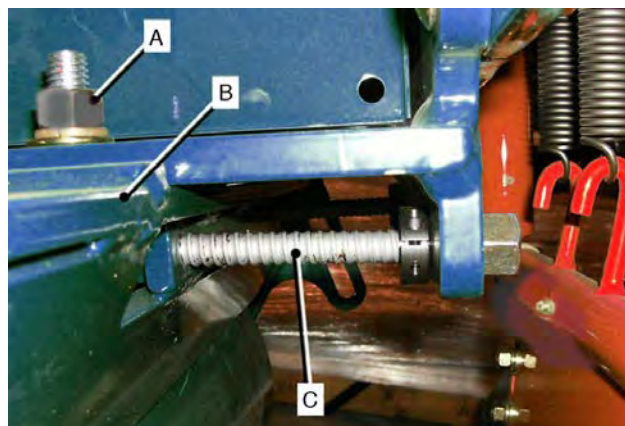
See page 4-21 for adjustment procedure.



Ground Roller Adjustment.

To adjust the clearance between the Ground Roller and the Cutting Blade :

- Loosen the four Locknuts 'A', sufficient to allow the Roller Bracket 'B', to 'slide' freely.
- Turn the Adjusting Bolt 'C', 'clockwise' to **reduce** the Roller to Blade clearance.
- Turn the Adjusting Bolt 'C' 'counterclockwise' to **increase** the Roller to Blade clearance.
- To ensure that the Roller Bracket is 'square' to the Frame, turn the Adjusting Bolts 'evenly' on both sides of the frame. Check that the 'notches' 'D', in the Roller Bracket and those in the Frame are aligned equally, on both sides.
- Fully tighten the Locknuts.
- To prevent dirt build-up on the Roller, adjust the Roller Scraper, to 1/32 in. clear of the Roller.



Depth of Cut.

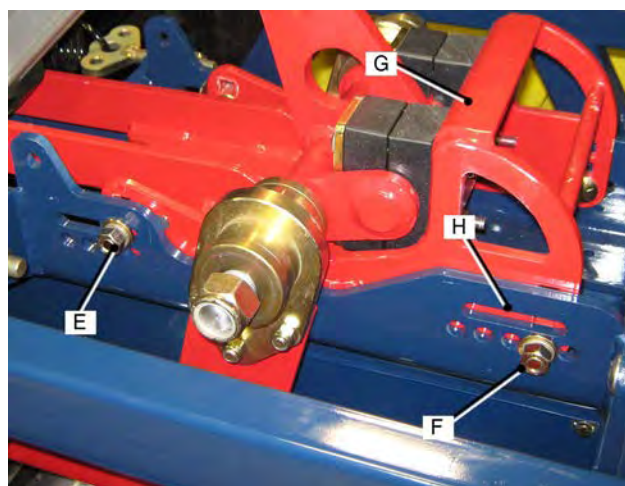
During operation the Depth of Cut is controlled on the Cab Control Handle. See Page 2-02.

Further adjustment can be made manually.

The machine is set-up at the factory with a Depth of Cut setting for 'average' conditions.

If manual adjustment is required to the depth of cut :

- Loosen the Rear Adjustment Bolts 'E'.
- Remove the Front Lock-bolts 'F'.
- To '**decrease**' the Depth of Cut, lift the Adjustment Frame 'G', 'UP', and fit the Front Lock-bolts into the Adjustment Slot 'H' and the 'lower' hole in the Adjustment Frame 'G'.
- To '**increase**' the Depth of Cut, lower the Adjustment Frame, and fit the Front Lock-bolts into the Adjustment Slot and into the '**upper**' hole in the Adjustment Frame.
- Remove the Rear Adjustment Bolts 'E', and fit them into the same, 'upper' or 'lower', hole in the Adjustment Frame 'G', as the front Locator Bolts.



IMPORTANT

Do not attempt to install the front Lock-bolts in the **lower set of holes** in the Cutter Head Frame and the **top hole** in the Adjustment Frame, as the Adjustment Frame will foul against the Cutter Head Frame

ADJUSTMENTS

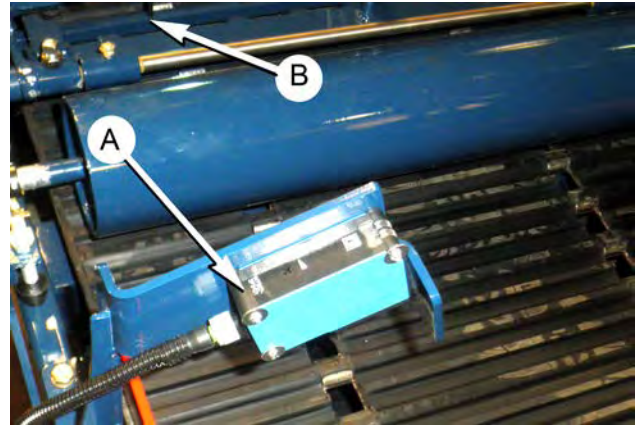
Sod 'END' Electronic Sensor. (If installed).

Before the leading edge of the sod has reached the Starter Gate the Sod End is detected by the Electronic Sensor 'A'. Some adjustment may be required to the Sensor, if so refer to Section 3 page 3-10.

As the Sod passes into the Starter Gate 'B' the Roll-Up sequence will begin.

NOTE

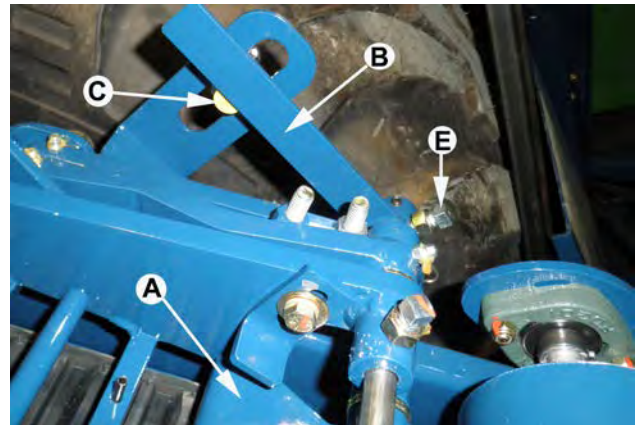
Electronic or a Mechanical type sod end sensor may be installed depending on the customer preference.



Sod End Sensor – Mechanical Type. (PROX Sensor).

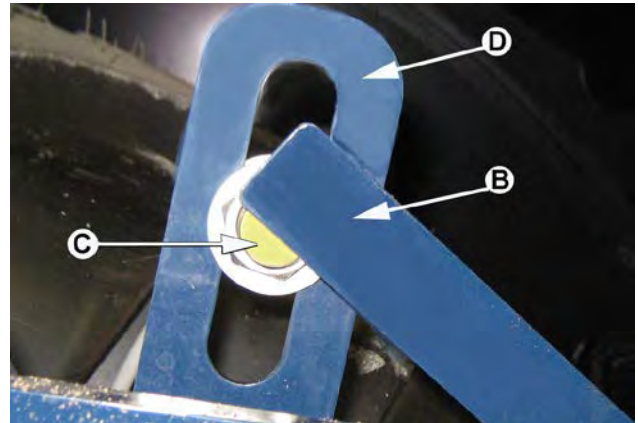
Before the leading edge of the sod has reached the Starter Gate 'A' the roll 'END' sequence 'Starts' with the Sensor Flag 'B' positioned in front of the Sensor 'C'. See adjustment procedure below.

As the sod passes into the Starter Gate 'A' the Sensor Flag 'B' will rotate 'UP' clear of the Sensor 'C'. When the trailing edge of the sod has passed the Starter Gate the Sensor Flag 'B' will rotate back across the face of the Sensor 'C'.



Sensor and Sensor Flag Setting.

- Position the Sensor 'C' in the center of the Slot 'D'. Do not fully tighten the locknuts.
- Loosen the Set Screw 'E' in the Sensor Flag boss and position the Sensor Flag half way across the face of the Sensor 'C'. Tighten the Set Screw 'E'.
- Adjust the locknuts on the sensor until the face of the sensor is **1/8in. to 1/4in.** from the sensor flag. Tighten the locknuts.



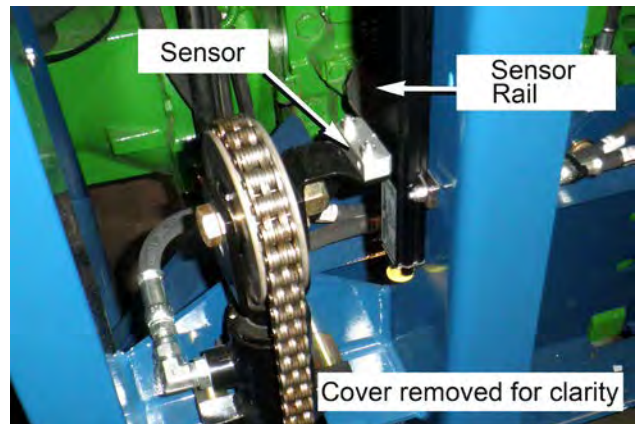
Pallet Lift Forks.

The Pallet Lift Forks are programmed to move 'down', from the 'upper' position, where two layers of sod are placed on the Pallet. To the 'mid' position, where one more layer is placed. Then to the 'lower' position, where the remaining layers are stacked.

Refer to Section 2, Control Panel and Screen, for operating procedure.

Pallet Lift Forks - Linear Transducer Sensor.

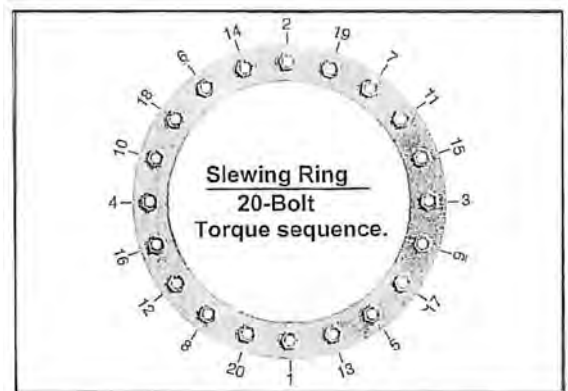
The Lift Forks position is 'sensed' at all points of travel on the Sensor Rail by the Sensor Slide and is programmed into the Controller. See page 3-04.
(There is no adjustment to the Sensor).



Robo Arm Slewing Ring

It is important that the twenty fine thread bolts securing the Slewing Ring to the Main Frame are tightened in the correct sequence.
Proceed as shown on the chart.

Torque to 100 ft/lbs. Check every 500 hours of operation or each six months.



SECTION 5

Proximity Sensors.	5-01
Main Electrical Control Box. Fuses and Power Relays.	5-02
Controllers – B , C and D1/D2 ..	5-02
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Optional Pallet Lift Weight Electrical Schematic	5-15

Section 5

Electrical System.

The design of the wiring/cable system simplifies the tracing of electrical faults, and if necessary, the replacement of the Cables.

The Cables from the Main Electrical Control Box, are connected to Multi-Port Connector Blocks. See page 5-06. The Cables from the 'Port Connections' to the Proximity Sensors, E-Stops, Transducers, Encoders and Solenoid Valves, are '**GRAY**'.

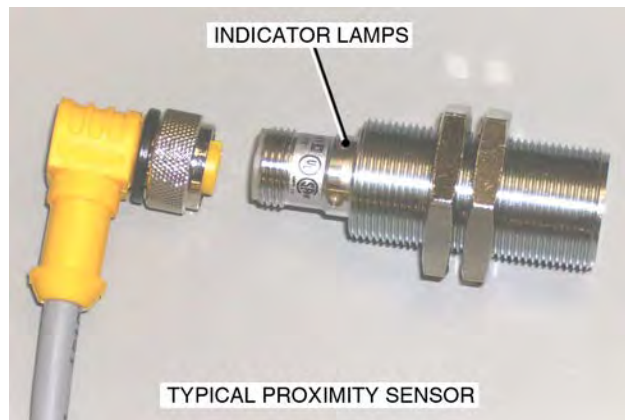
A '**GREEN**' Indicator Lamp on each Multi-Port Connector Block indicates that power from the Main Electrical Control Box to the Block is '**ON**'. See page 5-05.

A '**YELLOW**' Indicator Lamp, at each Cable 'port connection', indicates that the signal power is '**ON**' in the Cable connecting it to its particular function.

Proximity Sensors.

The Proximity Sensors have Power '**ON**' Indicator Lamps. Indicator Lamps allow the power loss at any Sensor to be quickly traced .

The threaded Connector Plugs are sealed, and designed to be trouble free, but should be checked periodically for tightness, and for moisture or corrosion in the Connectors.



IMPORTANT

- If, due to electrical faults, a problem persists with the operation of the machine, it is recommended that you contact your Brouwer Dealer, or the Factory Service Department.
- The diagnosis and/or repair of electrical problems that are beyond the scope of this manual, **must be done ONLY BY FACTORY TRAINED TECHNICIANS, using the proper diagnostic equipment.**



CAUTION

The Battery Cables **MUST** be disconnected before **doing any welding procedures on the machine.** Failure to follow this instruction will result in serious damage to the Electrical System.

ELECTRICAL SYSTEM

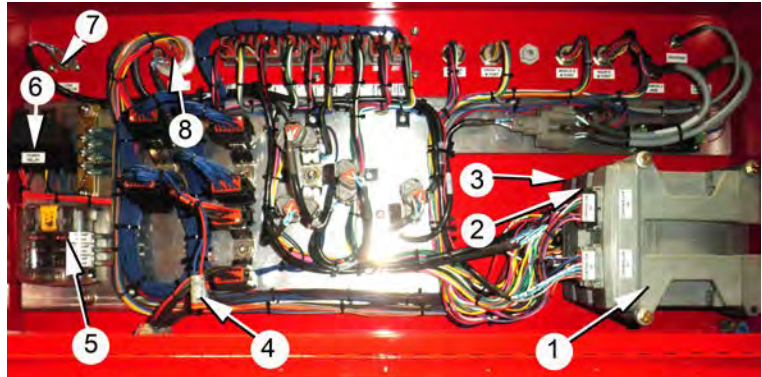
Main Control Box.

Controllers and System Fuses.

If power is lost to the electrical system :

- Check the Fuses. (Refer to P5-03).
- Check for a 'short', or poor connection, in the cables between the Controllers and the Main Electrical Control Box.
- Check the wiring connections, and the Power System Relay in the Main Control Box.

Main Electrical Control Box.



- | | |
|---------------------------|------------------------------|
| 1. Controllers 'D1/D2'. | 5. Fuses. (Refer to P5-03). |
| 2. Controller 'C'. | 6. Power Relays |
| 3. Controller 'B'. | 7. COM Cable. (Diagnostics). |
| 4. 12V Supply. (Lap Top). | 8. 31 PIN Connector. |

Controllers.

Controllers 'B', 'C' and 'D1/D2', are pre-programmed and **must not be tampered with**.

They **must be installed** in their correct locations.

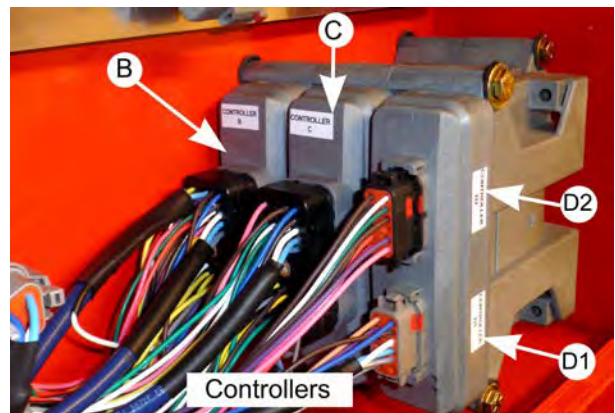
LED Indicators show that power is at the Controller.

System Fuses.

If a Fuse is 'blown', and persists in doing so:

- Check the wiring from the Fuse to the cable connection in the Control Box.

If the fault is not in the Control Box Wiring, further checks as shown on the following page will be necessary



CAUTION

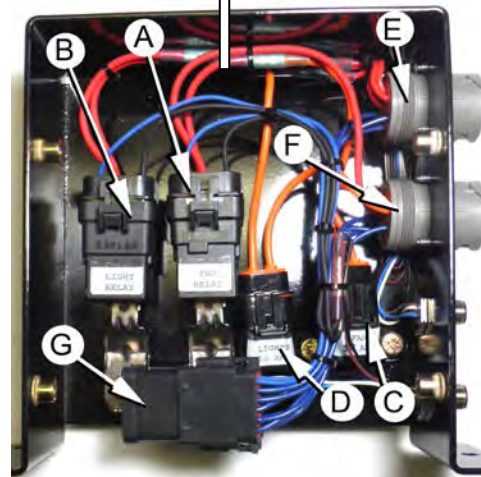
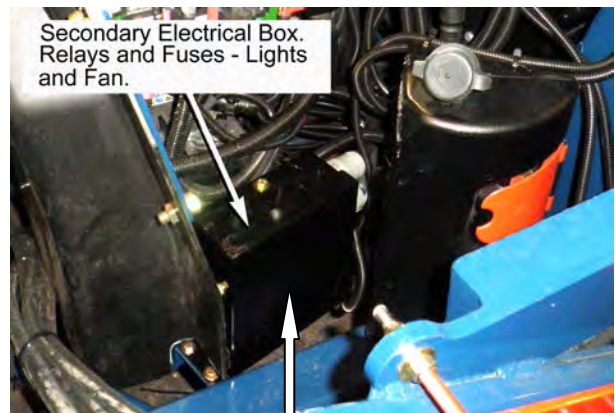
Under no circumstances must a Fuse be by-passed or one of the incorrect value used as this will result in damage to the electrical components, and also could result in a fire causing **damage to the machine and personal injury**.

Secondary Electrical Box.

(Located between cab and conveyor).

Relays and Fuses – Cooler Fan and Lights

- A. Cooler Fan Relay.
- B. Lights Relay.
- C. 30 amp Fuse – Fan.
- D. 10 amp Fuse – Lights
- E. Connector Plug – to Lights.
- F. Connector Plug – to Fan.
- G. Ground BUS

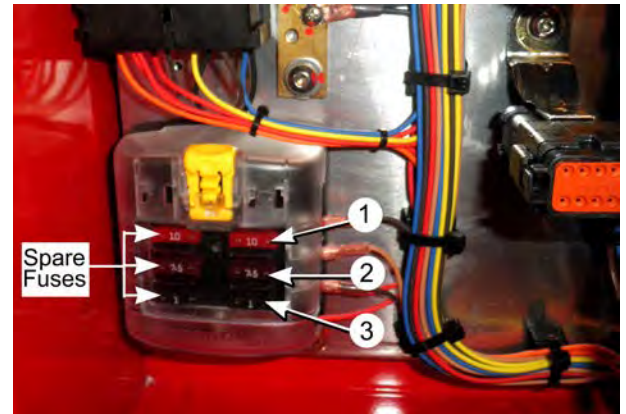


Secondary Electrical Box

The wiring system is complex, and beyond the scope of the Operator's Manual. The items listed below, and in the following pages, are those that may require attention but do not require specialized knowledge or diagnostic and testing equipment.

The operator should not attempt any service or repair to the electrical system, other than the checks specified.
If the following checks do not restore the functions, contact your dealer or factory service department.

ITEM.	LOCATION
Fuse Locations.	Main Control Box. RH Electrical Box. (Page 5-02).
DIN Connector.	Solenoid Valves : Auto-Steer Solenoid. Head Lift – Relief Valve.
Proximity Sensors	Cut-Off.(15mm). Head 'Down'.(15mm). Slab 'end' (8mm). Roll Flap (tooth count).(4mm). Pallet Inject Pallet Load 'Drop'.(4mm). Pallet 'Drop' Home.(4mm). Pallet 'Drop' Away (4mm). Pallet 'Home' – 'Away' (15mm). Gate 'Open – Close'.(8mm). Index Conveyor Cleats.(8mm).
Linear Transducer	Forks Height Sensing
Rotary Encoder	Wheel Encoder – Cutoff Length



Main Control Box Fuses.

1. 10A. - Power BUS 1.
(Controllers B,C and D).
2. 7.5A.- Power BUS 2.
Encoder; Arm Rotate, Reach and Lift Cylinders).
3. 1A. - Robo Arm. Hub Connection and Ground Speed Encoder.



Controller 'A'

Cab Display. Controller 'A'.

If Controller 'A' displays '!!NO CAN BUS!!', it indicates one of the following :

- Loss of power to the controllers. Check the LED Indicators. If they are 'ON' the controller may be faulty.
If they are not 'ON', check the fuses/wiring to restore power.
- Loss of 'signal' from a controller to the screen

Connection 'FAULT' Screen.

The Connection Fault screen will be displayed if a fuse is 'blown', a cable connection is broken or other circuit sensor problem.

In the example shown the Gripper Turn Sensor is faulty.

Also shown on the screen are:

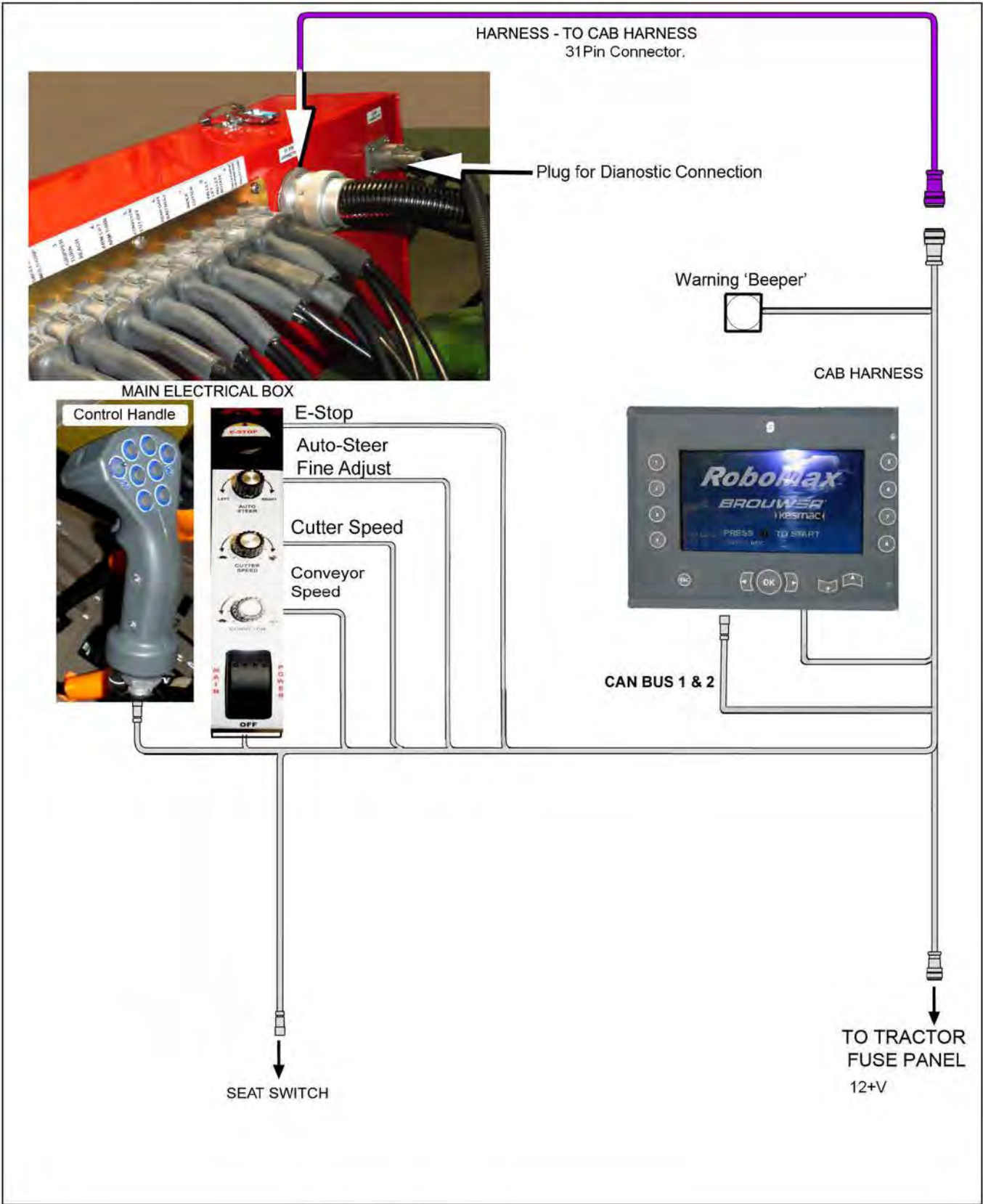
- PCB and TFT temperatures.
- CANBUS 1. and CANBUS 2. status.(ON/OFF).



Connection 'FAULT' Screen.

ELECTRICAL SYSTEM

Cab Wiring Harness and Connection to the Main Electrical Control Box.



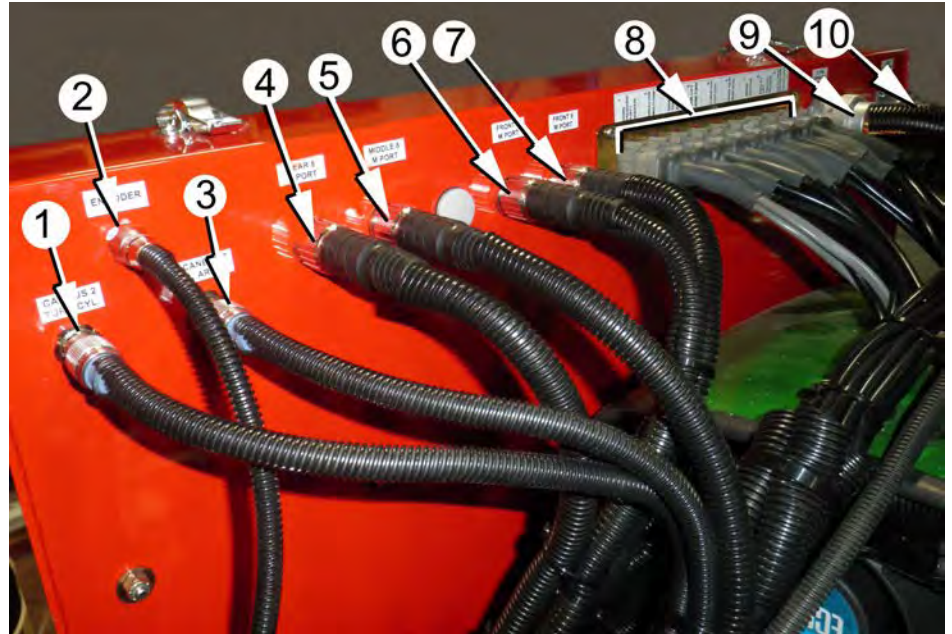
Cab Wiring Harness.

Main Electrical Control Box - Cable 'Output' Connections.

Cable connections to the: PVG Valves, Multi-Port Connector Blocks, and other functions, are shown. It is imperative that if a cables are disconnected from the Control Box, **they are labeled**, to ensure that they reconnected correctly. Cable Connections should be checked frequently for tightness.

Cable Connections.

1. CAN BUS 2. Turn Cylinder.
2. Encoder.
3. CAN BUS 2. Arm
4. Rear M8 Port. R8.
5. Middle M8 Port M8
6. Front M4 Port. F4.
7. Front M8 Port. F8.
8. PVG. Control Valves.
(See P5-13).
9. 31-Pin Connector to Cab
Harness
10. Diagnostic Connection.
(Lap Top).



Main Electrical Control Box. Rear Connections.

Refer to Pages 10, 11 and 12 for cable diagrams.

IMPORTANT

Do not direct the water jet from a high pressure washer at electrical components.

Multi-Port Connector Blocks.

A '**GREEN**' lamp indicates there is power to the Connector Block.

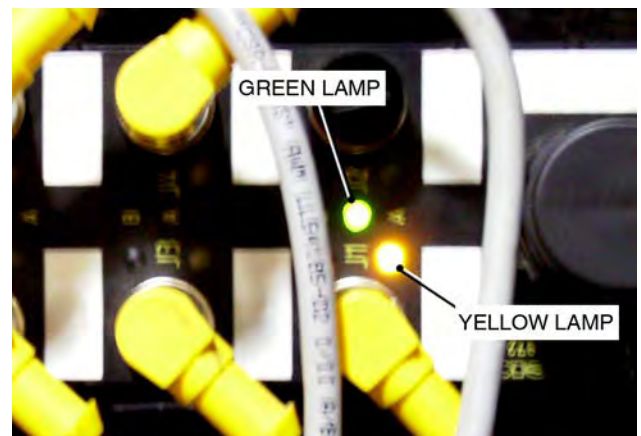
A '**YELLOW**' Lamp indicates that Signal Power is going from the 'PORT' Connection, via the Cables, to the :

- Proximity Sensors.
- Linier Transducer.
- Rotary Encoders.
- E-Stops.
- Valve Bank Solenoids.

The cables to and from the Connector Blocks are easily identified and can be quickly checked.

Indicator Lamps in the Proximity Sensors verify that Signal Power is going to the Sensor. See page 5-01.

Refer to page 5-13 for example of 'fault' tracing.



ELECTRICAL SYSTEM

Multi-Port Connector Blocks.

No.1. Front Eight Port Block. (F8)

- J1. Fan Relay.
- J2. Head 'DOWN'.
- J3. Filter Sensor.
- J4. Cut-Off.
- J5. Steer 'RIGHT'.
- J6. Steer 'LEFT'.
- J7. Ski 'UP'.
- J8. Ski 'DOWN'.

No.2. Rear Eight Port Block. (R8)

- J1. Pallet Inject 'HOME'.
- J2. Pallet Inject 'AWAY'.
- J3. Load 'UP'.
- J4. Load 'DOWN'.
- J5. Drop 'HOME'. 'UP'. (Double Side Pallet Inject. Push Bar 'HOME'.)
- J6. Drop 'AWAY'. 'DOWN'. (Double Sided Pallet Inject. Push bar 'AWAY').
- J7. Not Used.
- J8. Dispenser 'Safe'. (Optional Double Sided Pallet).

To prevent cables from being connected to the wrong 'PORT', they are labeled showing the Port Block location and 'PORT' number.

Typical Multi-Port Connector Block.

The Connector Block 'outputs' are numbered J1 to J8, or J1 to J4, as listed above.

See page 5-05, for the Connector Block Power Indicator Lamps :

- 'GREEN' for Power to the Block.
- 'YELLOW' for Signal Power from the Connector Block to the function.

The 12 Pin Connection is Power 'IN' from the Main Electrical Control Box.

No.3. Front Four Port Block. (F4)

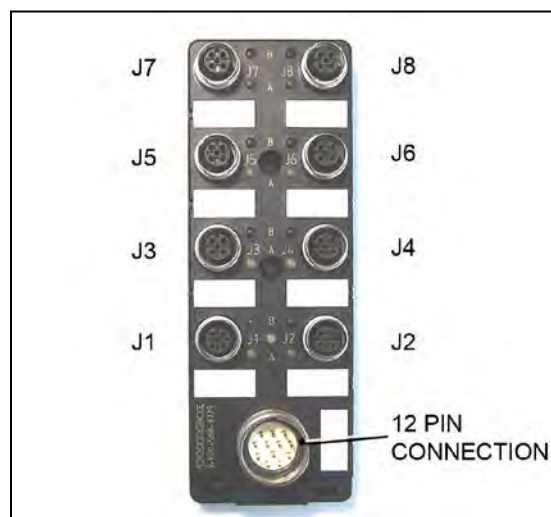
- J1. Auto-Steer. Column Sensor.
- J2. Auto-Steer. Axle (King Pin) Sensor
- J3. Temperature Sense.
- J4. Forks Linear Transducer.

No.4. Right Mid. Eight Port Block. (M8)

- J1. Lift Pressure Switch.
- J2. Roll End.
- J3. Conveyor speed.
- J4. E-Stop.
- J5. Index Conveyor position.
- J6. Spare
- J7. Gate 'OPEN'.
- J8. Gate 'CLOSED' Pressure Switch.

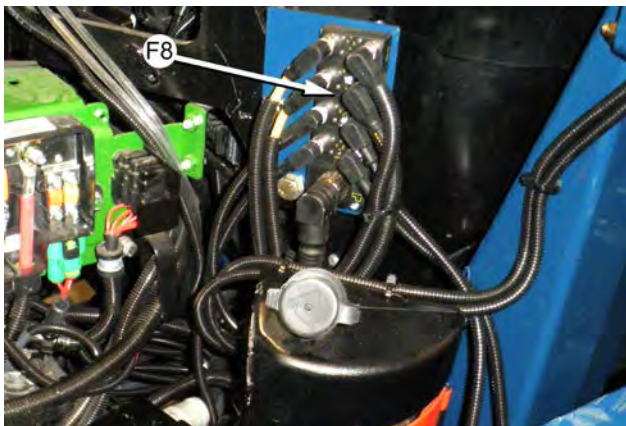


Cable Identification.
Front 4-Port Block. Port J3.

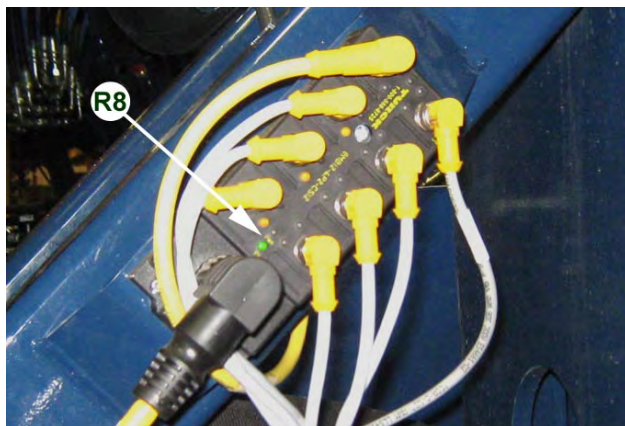


Typical 8-Port Connector Block.

Multi-Port Connector Blocks.



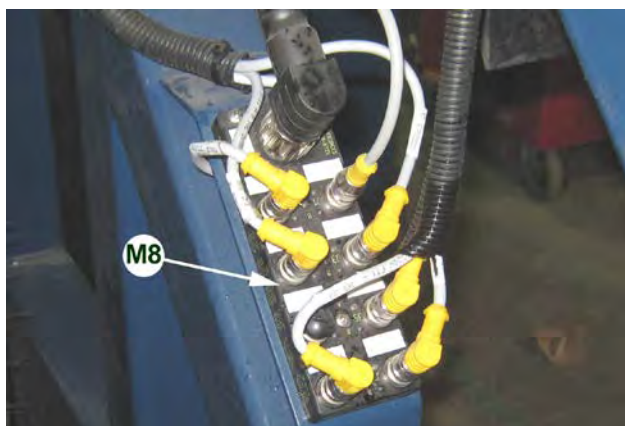
No.1. Front 8-Port Block. (F8).



No.2. Rear 8-Port Block. (R8).



No.3. Front 4-Port Block. (F4).Left side.



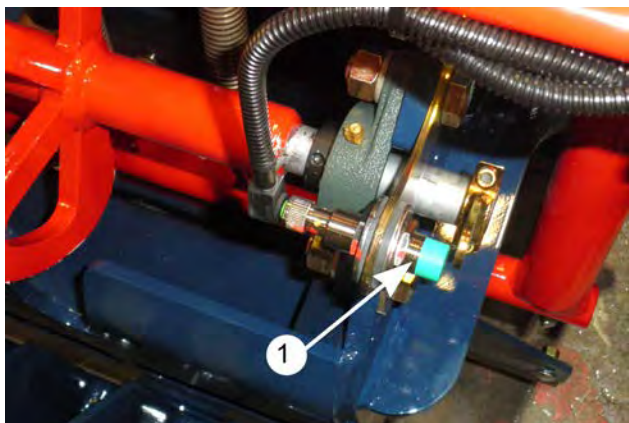
No.4. Right Mid. 8-Port Block. (M8).

NOTE

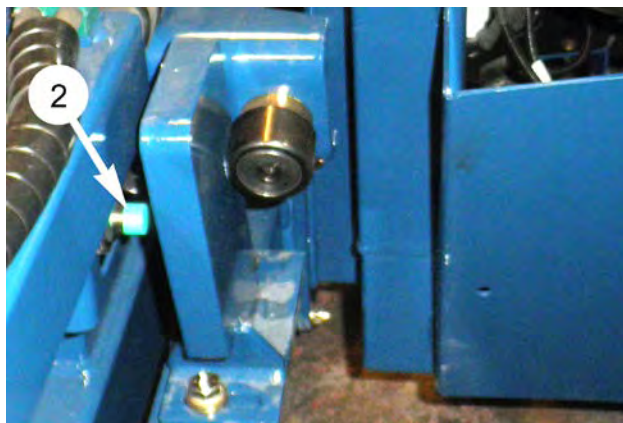
Refer to pages 10, 11, and 12 for Electrical Diagrams.

ELECTRICAL SYSTEM

Proximity Sensors



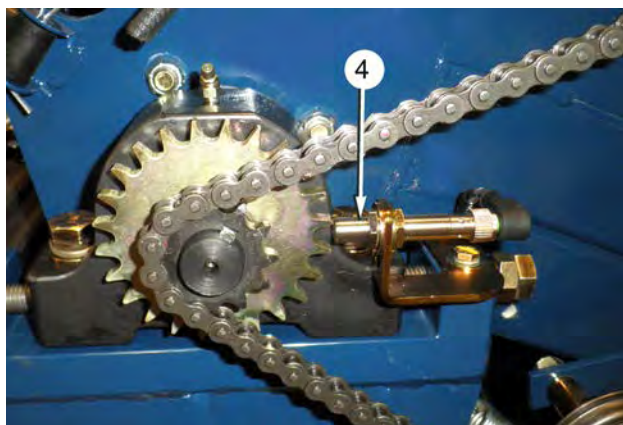
1. Cut-Off Sensor.



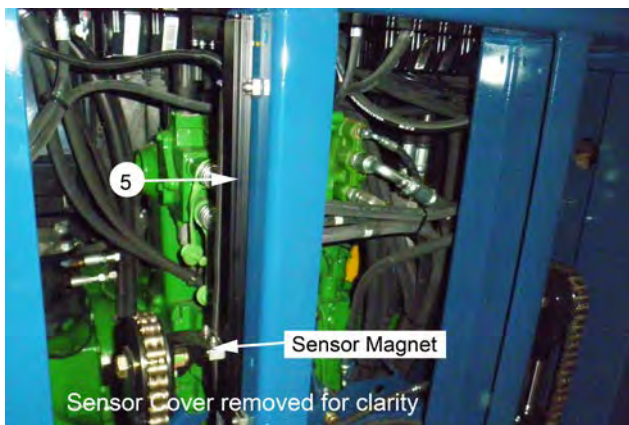
2. Head 'DOWN' Sensor.



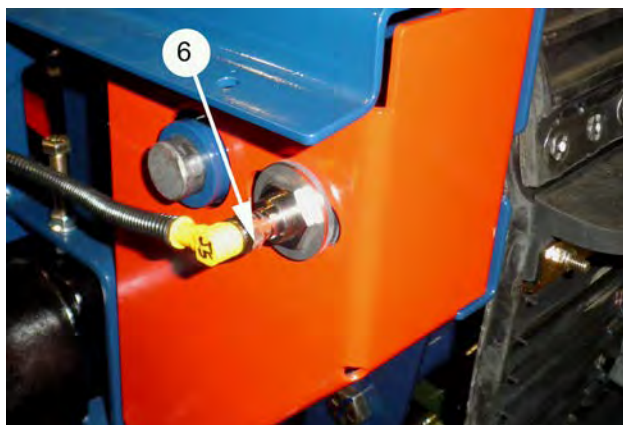
3. Electronic Sod End Sensor.
(See page 4-24 for mechanical (PROX) sensor).



4. Roll Flap (Tooth Count) Sensor.



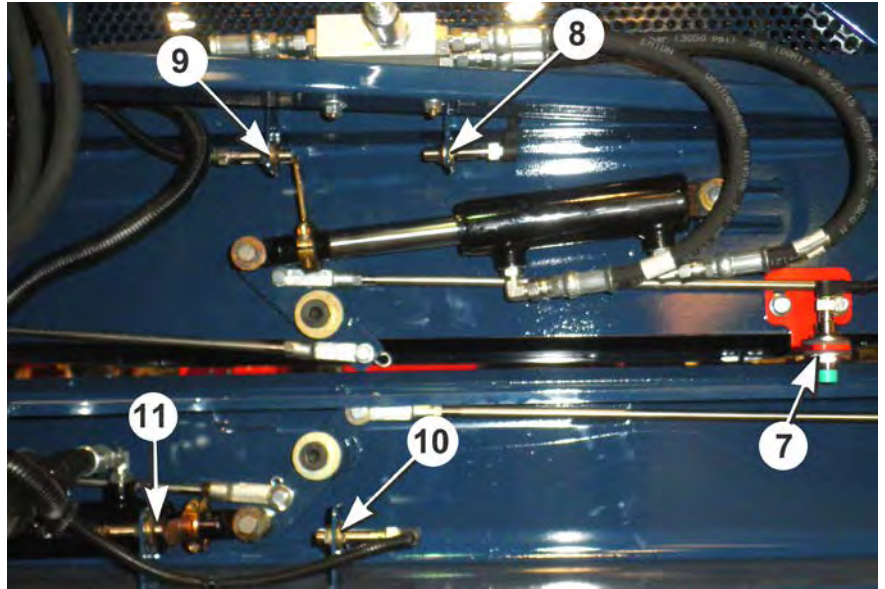
5. Forks Height Rail Sensor



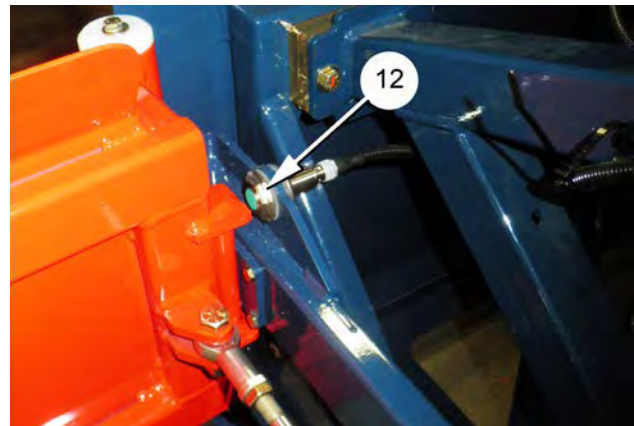
6. Index Conveyor 'CLEATS' Position Sensor.

See page 5-14 for adjustment required if a new Forks Rail Sensor is installed.

- 7. Pallet Inject - 'HOME/AWAY'.
- 8. Load - "CLOSE".
- 9. Load - 'OPEN'.
- 10. Pallet - 'DROP' Open.
- 11. Pallet - 'Drop' Close.



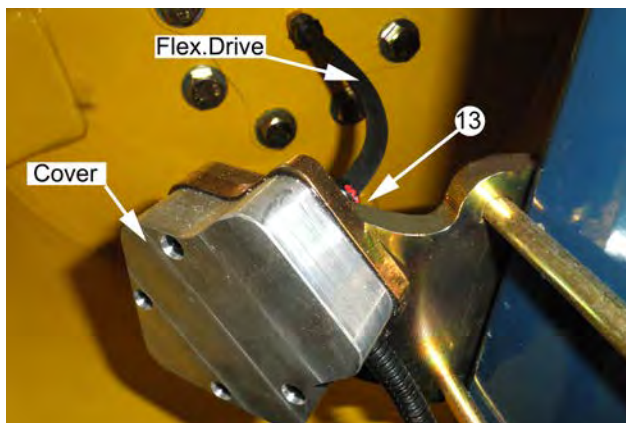
- 12. Gate - 'Open'.
(‘Closed’ position is determined by pressure switch).



IMPORTANT

Check regularly the sensors cable connections for tightness.
Clean dirt and debris from face of sensors
Check the 'Gap' to the target component, not to exceed ¼ inch. (6.35mm).

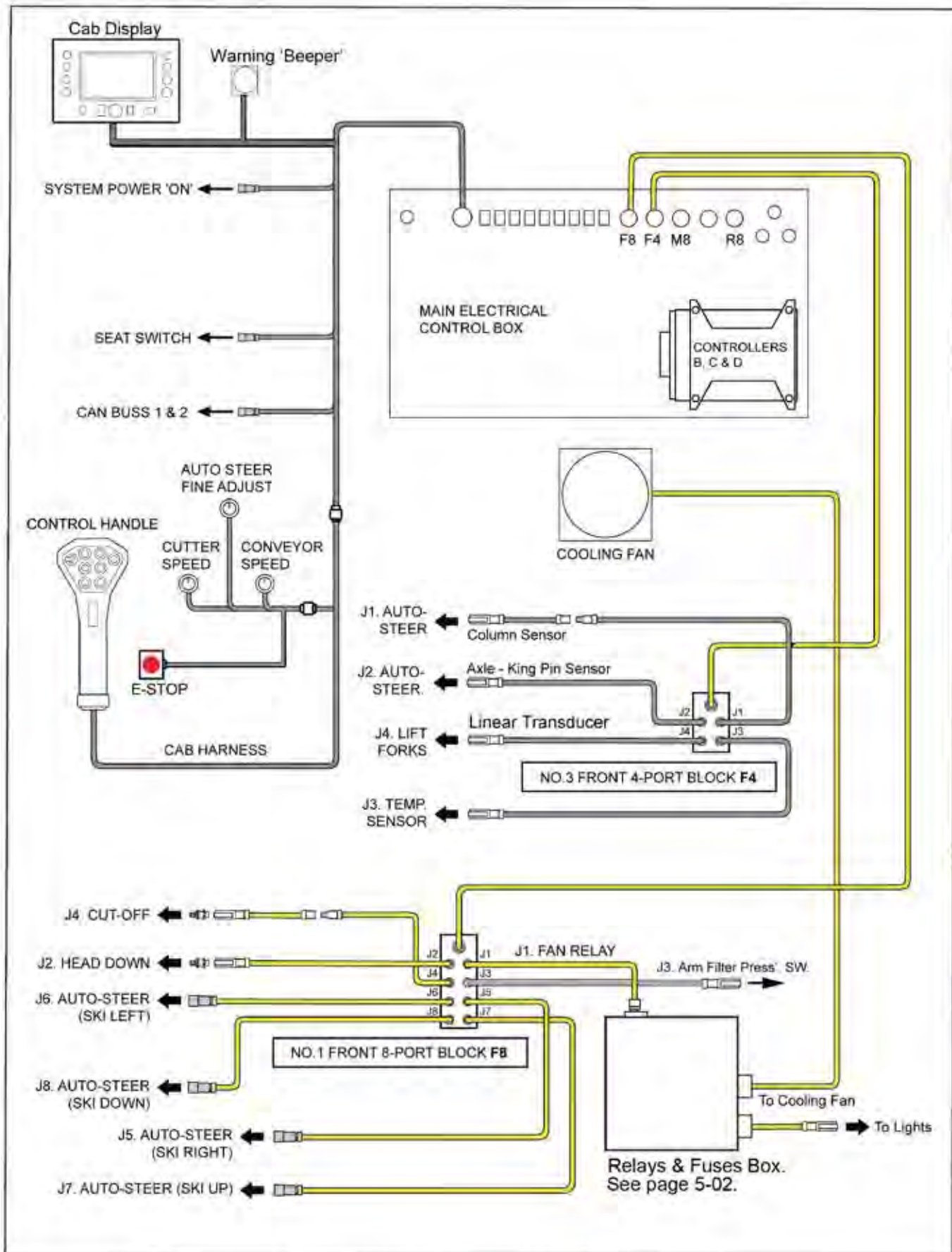
13. Wheel Rotary Encoder – Cut-Off



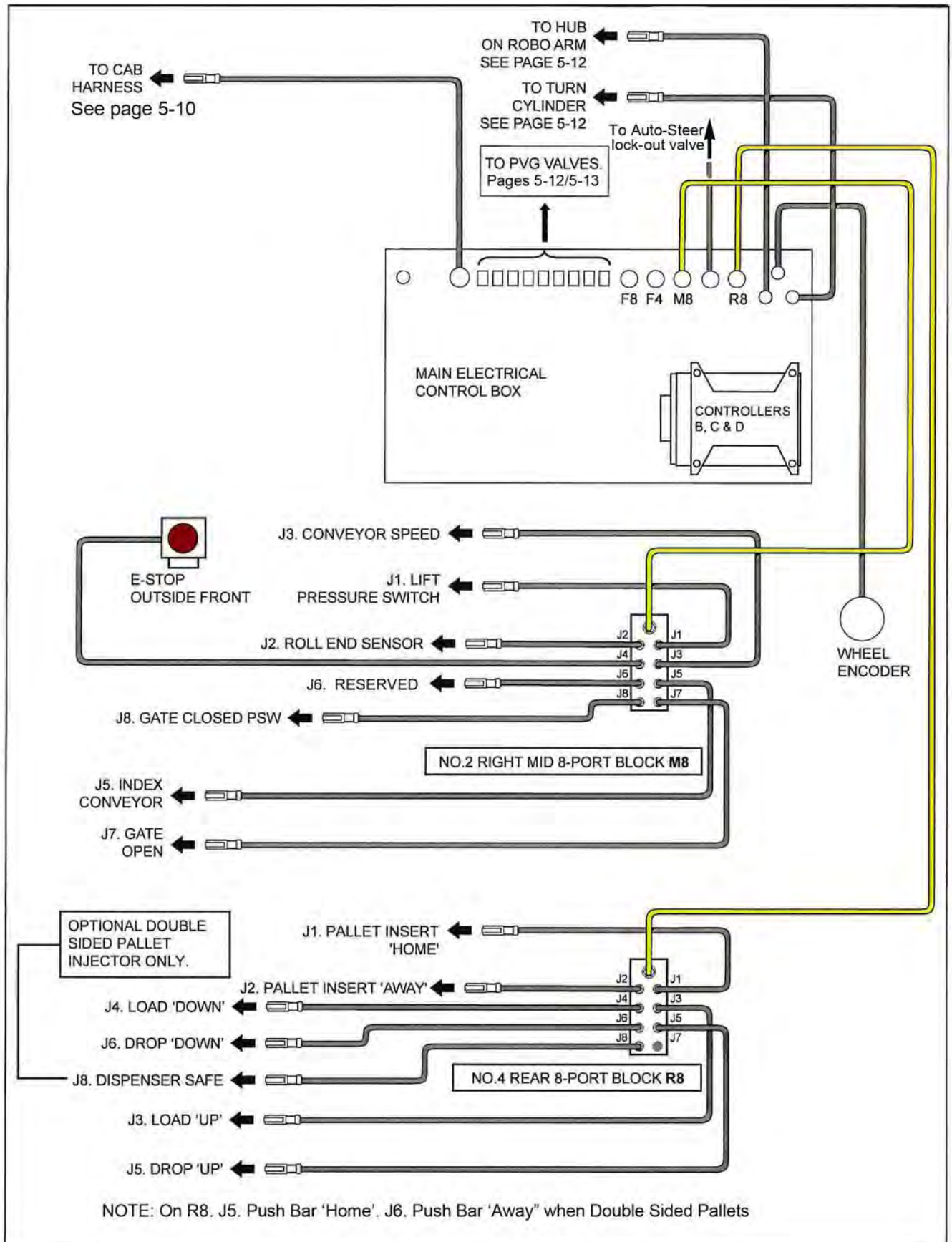
NOTE

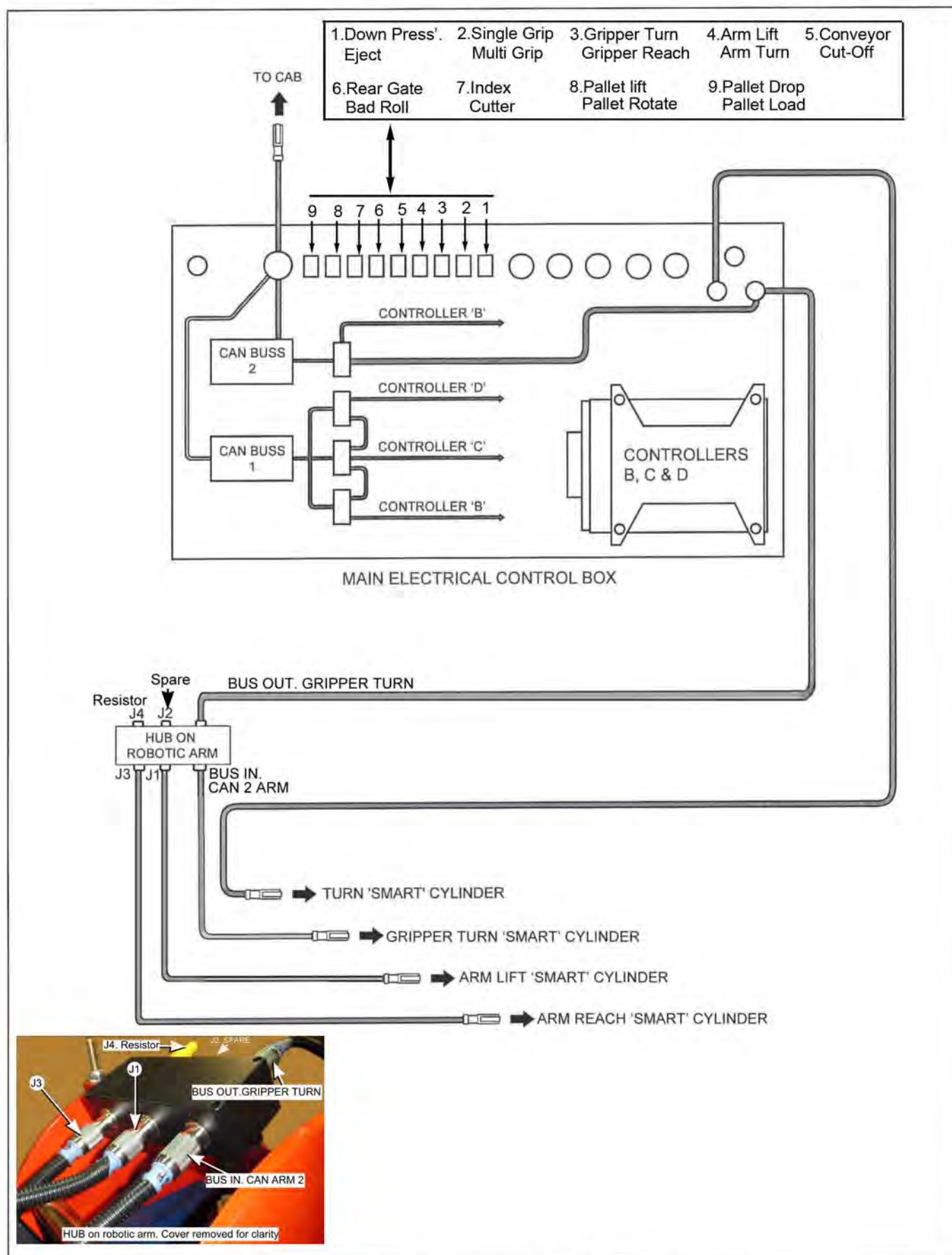
The Rotary Encoder is a sealed unit.
Do not attempt to service or repair.

ELECTRICAL SYSTEM



ELECTRICAL SYSTEM DIAGRAM. Sheet 1





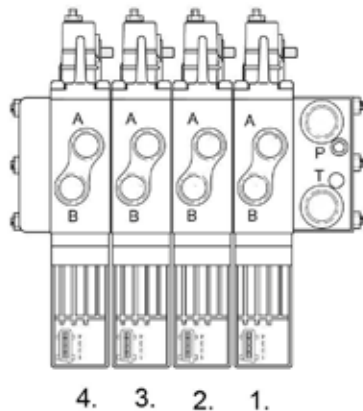
ELECTRICAL SYSTEM DIAGRAM. Sheet 3

RoboMax JD

Electrical System.

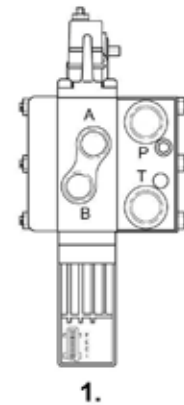
PVG. Control Valves - Electrical Connections from the Main Control Box.

4-Bank PVG Control Valves



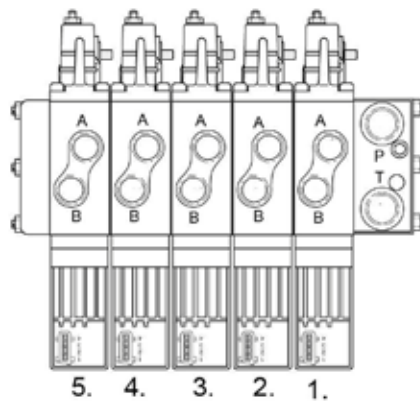
1. Pallet Drop
2. Pallet Load
3. Pallet Rotate.
4. Forks (Pallet Lift)

1-Bank PVG Control Valves (From Tractor).



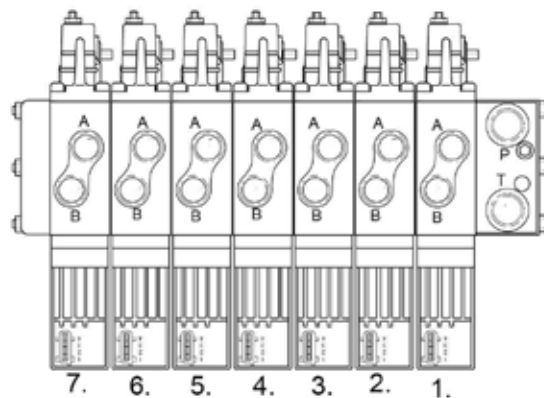
1. Cutter Motor

5-Bank PVG Control Valves.



1. Index Conveyor.
2. Bad Roll Eject.
3. Rear Gate.
4. Cut-Off.
5. Conveyor.

7 - Bank PVG Control Valves.



1. Arm Rotate.
 2. Arm Lift.
 3. Arm Reach.
 4. Gripper Head - Rotate.
 5. Multi Grip.
 6. Single Grip.
 7. Squeeze.
-

ELECTRICAL SYSTEM

Forks Rail Sensor – Adjustment.

When a new Rail Sensor is installed the following adjustment **must be made**.

Fig 1.

Remove the Rail Sensor cover.

With the cylinders **fully retracted**, and the forks on the ground :

- Fit the new Rail Sensor into the retainer Clamps.
- Do not fully tighten the Clamps, to allow for adjustment of the Rail Sensor.

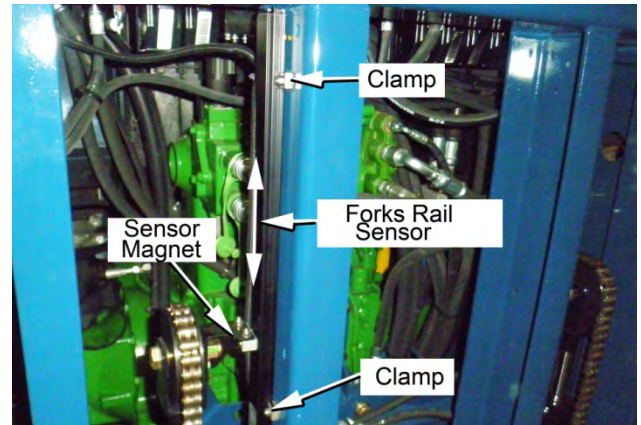


Fig.1 Rail Sensor cover removed.

Fig. 2

- Slide the Rail Sensor 'UP' or 'DOWN' to attain a reading of 200mV. on the calibration display screen.
- Tighten the Retainer Clamps.
- Refit the Rail Sensor cover.

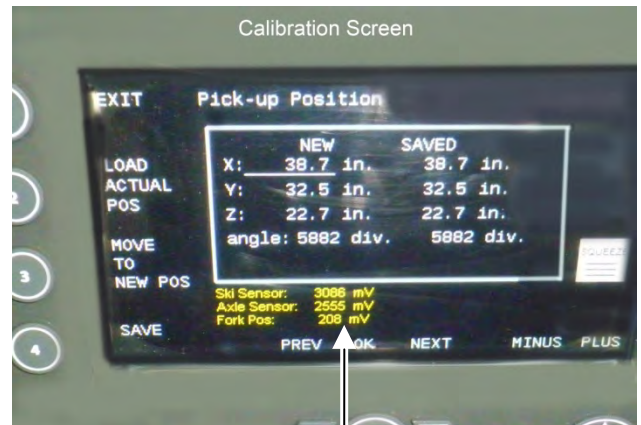
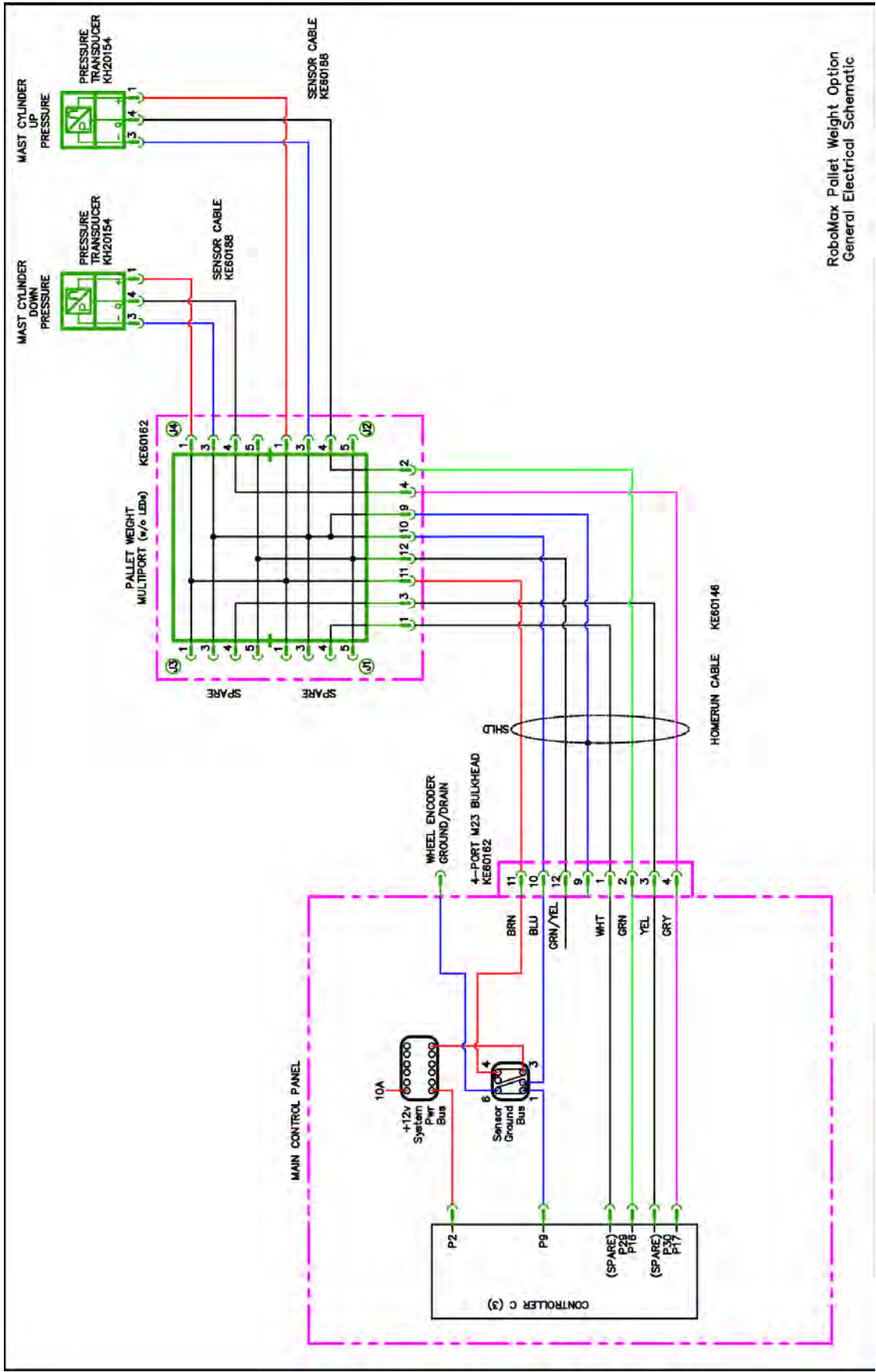


Fig.2

200 mV.

Optional Pallet Lift Weight Electrical Schematic



RoboMax Pallet Weight Option
General Electrical Schematic

SECTION 6

Set-up and Operation	6-01
Electrical Diagram	6-02
Hydraulic Schematic	6-03
Ski Set-up and alignment	6-04
Column Sensor and Axle Sensor adjustment	6-05

Auto-Steer Operation.

When the machine is ready to commence harvesting, it is important that the Auto-Steer set-up is carried out as shown in the following instructions.

The operator must read the operating instructions in Sections 2 and 3, before using the Auto-Steer.

Cutting the Starting Strip.

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

- Start the engine and Switch System Power '**ON**' with Switch '**A**'. Prepare to start the harvesting procedure as shown on page 3-07.

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

When the starting strip has been cut :

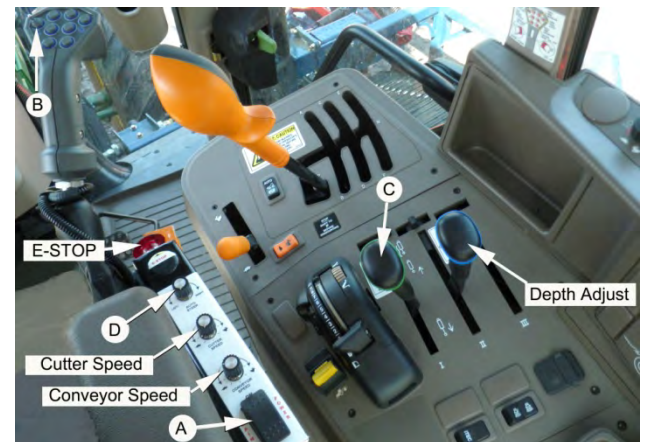
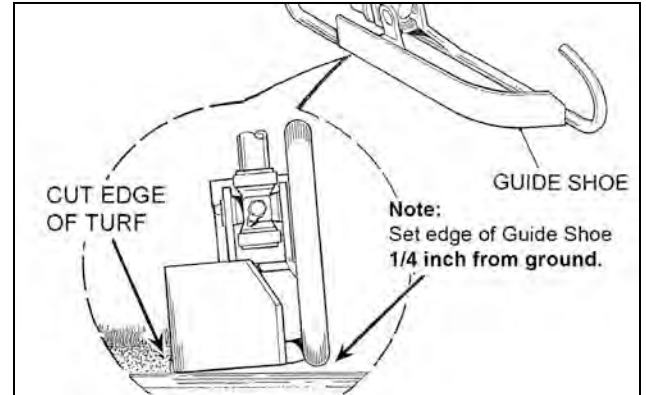
- Position the harvester parallel to the start strip, with the Cutter Side Blade aligned with the '**cut edge**' of the turf.
- Activate the Auto-Steer to '**ON**' with Switch '**B**', on the Control Handle.

NOTE

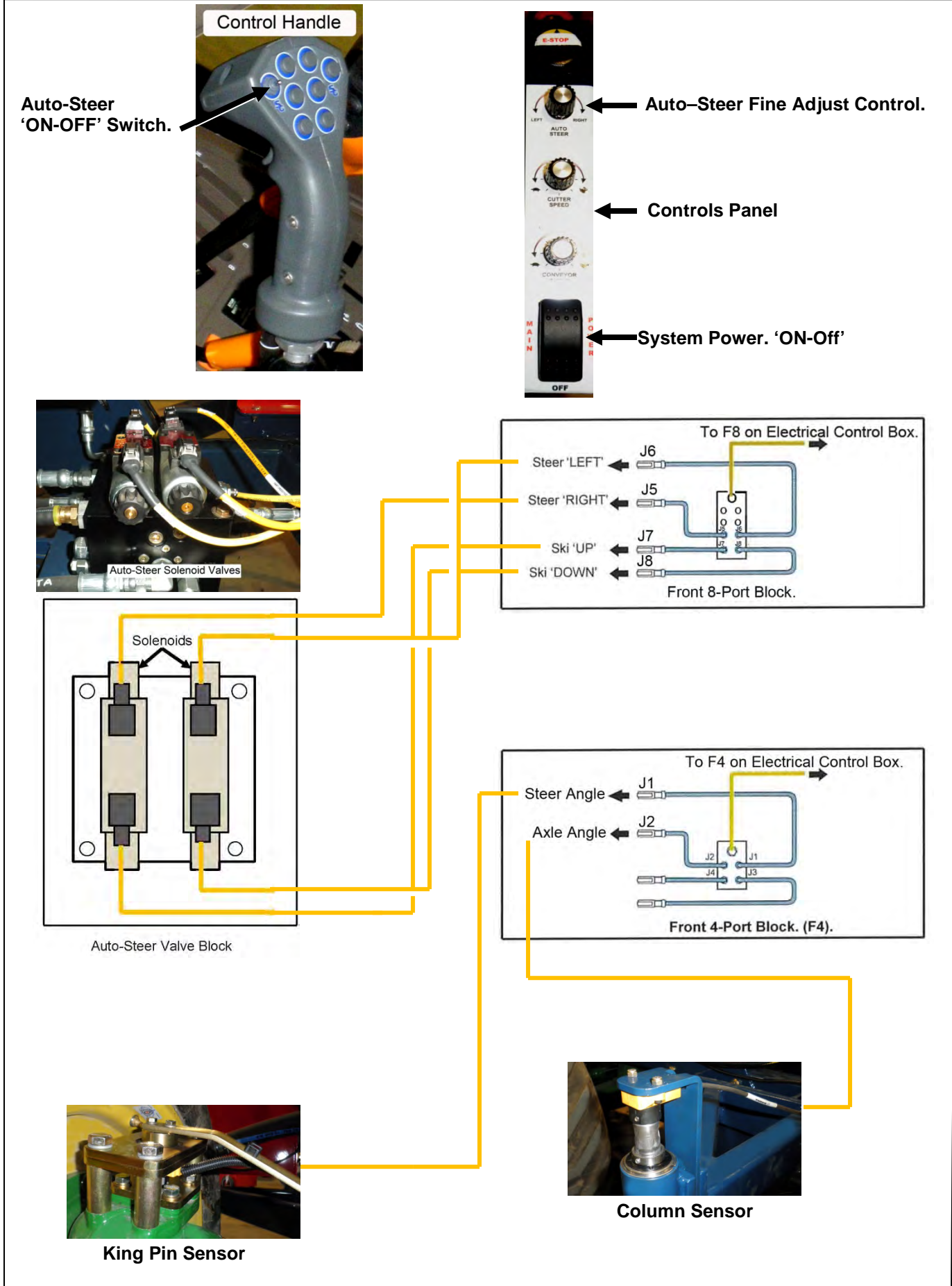
If the Guide Shoe lowers on the 'un-cut' turf, when the Auto-Steer is activated, turn the Auto-Steer '**OFF**'. The re-set cylinder will move the Guide Shoe 'off' the un-cut turf, then turn the Auto-Steer back '**ON**'.

Proceed to cut the second strip.

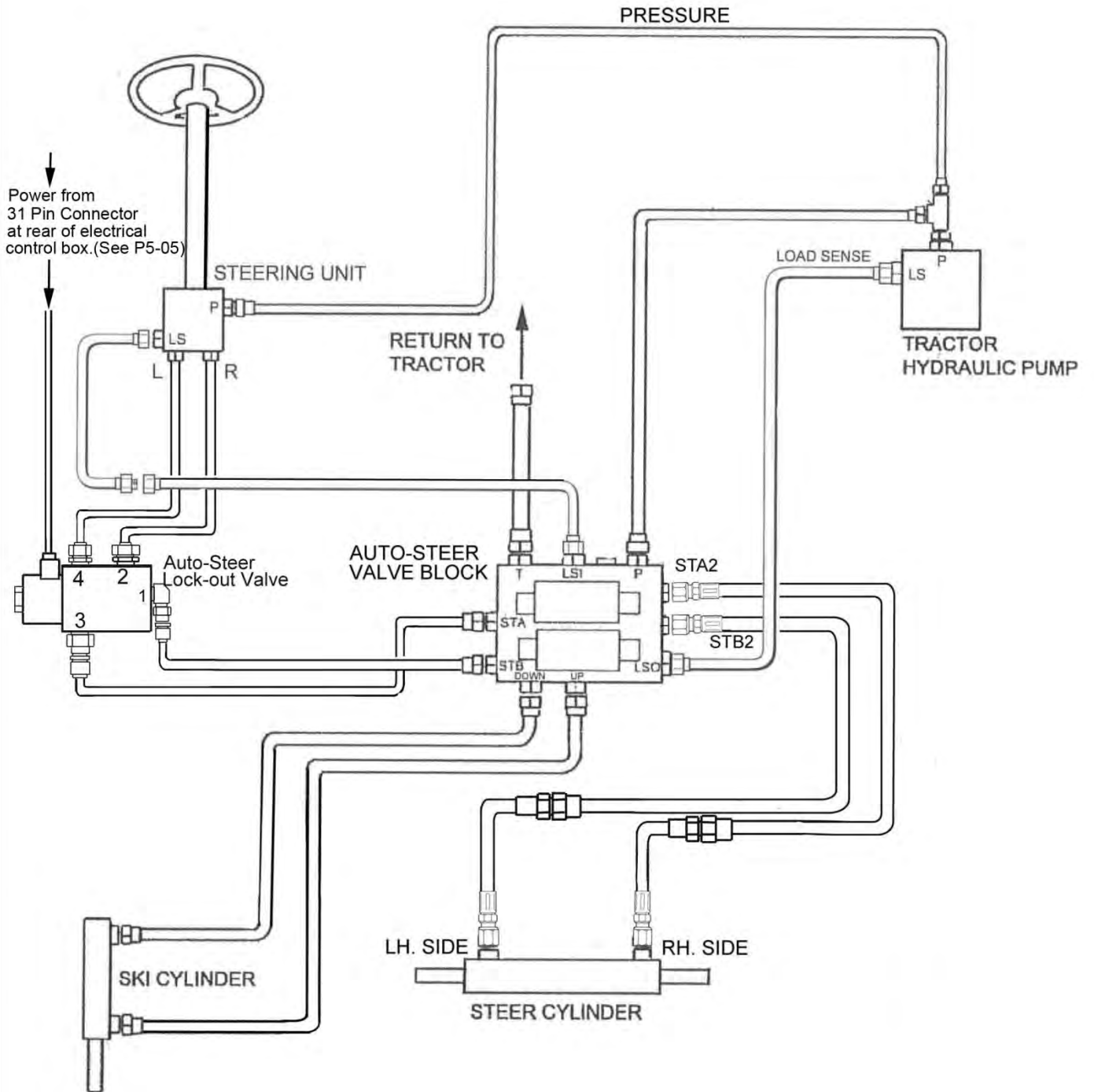
- Lower the Cutter Head with Lever '**C**'.
- Continue cutting the second strip.
- Use the 'Fine Adjust' Control '**D**', to trim any waste or leave a strip of turf if required.



ELECTRONIC AUTO-STEER



RoboMax JD. 6110M Auto-Steer Hydraulics.



RoboMax JD.

Auto-Steer Ski Alignment.

If a new Auto-Steer Ski Arm is installed correct alignment set-up is necessary as follows.

Fig.1

- On a smooth firm surface mark a line 'A' from the Cutter Blade parallel to the tractor frame.
- Loosen the Ski Arm Clamp Bolt (see fig.2).
- Position the Ski Arm 'B' along the line and place a suitable weight 'C' to hold it in place.

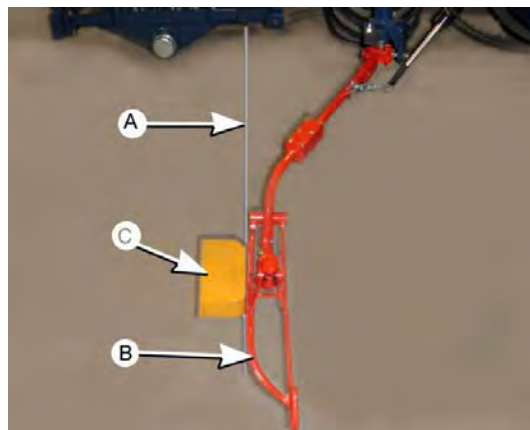


Fig.1

Fig.2

- Insert a Bar Tool into the top of the spring column shaft.
- Rotate the Bar Tool 135 deg. CCW.
- Hold the Bar Tool in this position and tighten the Ski Arm clamp bolt.

IMPORTANT

To prevent the Ski Arm from rotating on the column shaft the ski arm clamp bolt must be tightened to 115 lb-ft

Check that the Ski Sensor mV reading on the cab display is 2500 mV. Refer to page 6-05.



Fig.2.

Fig.3

The Ski Arm should be set at 80 to 85 deg. relative to the ground.

To adjust :

- Loosen the two clamp bolts in the mounting pivot.
- Loosen the locknut on the release bolt and screw the release bolt 'IN' to open up the clamp.
- Rotate the Ski Arm to the correct angle
- Back-off the release bolt , tighten the clamp bolts and tighten the release bolt locknut.

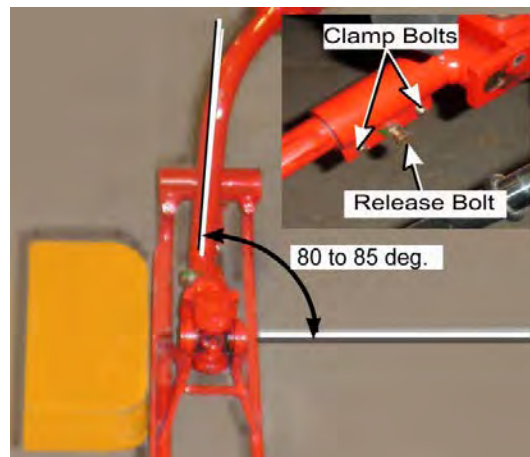


Fig.3

Fig.4

The Ski must be set so that there is 1/4 inch clearance between the inner edge of the Ski and the ground

To adjust:

- Loosen the clamp bolt 'A' and rotate the Ski 'B' to the correct setting and tighten the clamp bolt.

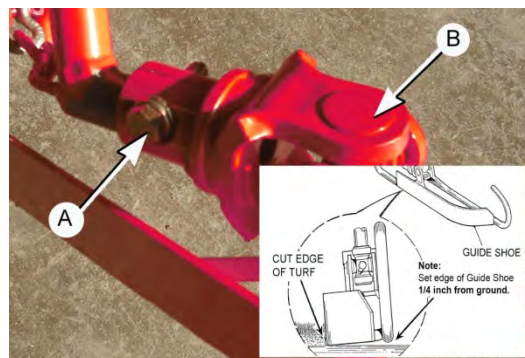


Fig.4

RoboMax JD. Auto-Steer and Axle King Pin Sensors – Adjustment.

Auto-Steer Ski Column Sensor.

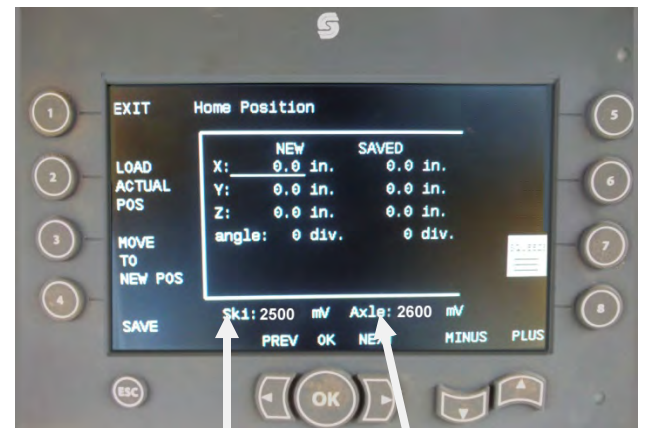
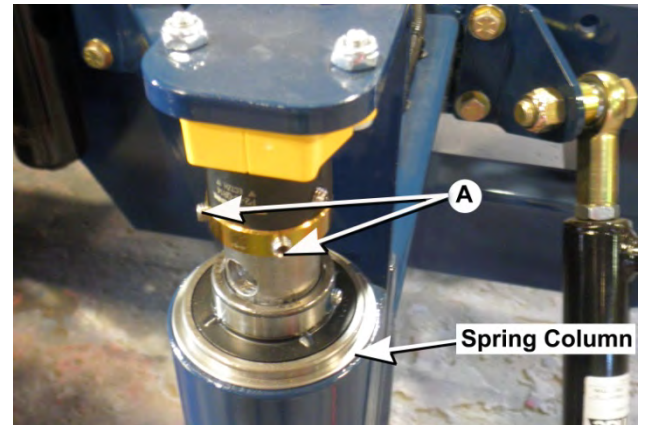
If the machine is leaving a 'Strip' that is not wanted, adjusting the 'Fine Adjust' control on the cab console will eliminate the strip. This will place the control 'off zero.(Straight ahead).

To re-set the control to zero:

Position the machine cutting straight ahead, ski edge in line with cutter blade . A second person loosens the two set screws 'A' in the Sensor and rotates the sensor until a SKI mV reading of 2500 mV. is shown on the display.

Re-tightened the Sensor set screws.

Re-set the fine adjust control to zero.



SKI: 2500 mV. AXLE: 2600 mV.

New Sensor Anti-rotation Arm - fitted from Serial No.270.

This new arm simplifies Axle Sensor adjustment.

If the machine is tending to drift right or left when cutting, adjust the King Pin Sensor as follows:

After the initial cut, steering manually, position the Auto-Steer Ski against the cut edge of the turf. Proceed to cut for approximately 100 yards , and stop the machine.

With the operator in position to observe the cab display, a second person loosens the Bolts 'C'. A slot in the anti-rotation arm allows the Axle King Pin Sensor to be turned, by hand, until the 'mV' value on the display reads: AXLE 2600 mV.

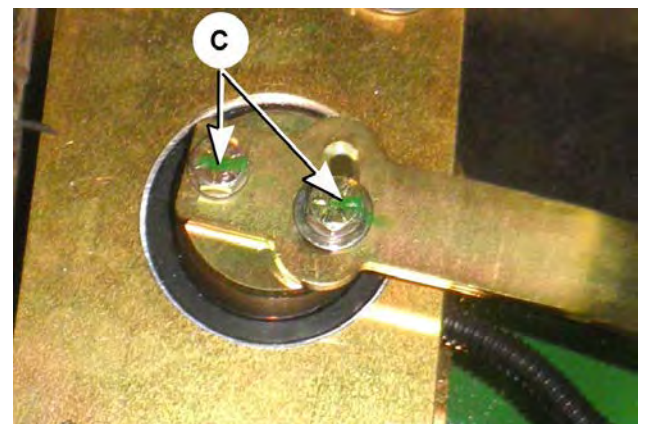
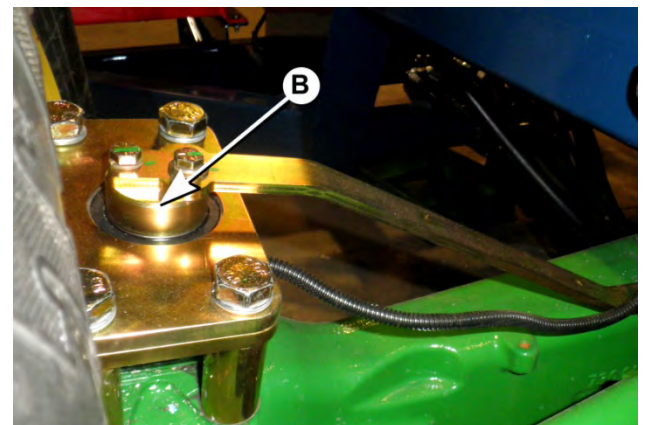
Re-tighten the Bolts 'C'.

Under normal operating conditions it should not be necessary to repeat these procedures.

NOTE

If the Ski or Ski Arm is damaged , e.g. by collision, and have to be replaced, the Column Spring tension and the Ski and Ski Arm alignment must be reset. See page 6-04

This will require the SKI and AXLE mV readings to be re-calibrated as shown above.



Section 7

NOTE

This section shows the changes required when the optional Double Sided Pallet Injector is installed.

PVG Control Valves.	7-01
Tractor Hydraulic Ports.	7-01
Hydraulic Schematic.	7-02
Control Valves. Electrical Connections.	7-03
Electrical Schematic. Sht. 1.	7-04
Electrical Schematic. Sht. 2.	7-05
Electrical Schematic. Sht. 3.	7-06
Rear 8 Port Block. (R8).	7-07
Proximity Sensors.	7-07
Pallet Injector Pivot Bearings – Lube.	7-08

MAINTENANCE

Hydraulic System. PVG. Control Valves.

The Control Valves, located to the rear of the cab window, can be manually operated with the window open.

IMPORTANT

Control Handles on the Control Valves are to be used **only when doing service work**, to enable functions to be checked. **DO NOT use for harvesting operations.**

The Seven Bank Valves control the following functions:

1. Arm Rotate Cylinder.
2. Arm Lift Cylinder.
3. Arm Reach Cylinder.
4. Gripper Rotate Cylinder.
5. Multi Finger Grip Cylinder.
6. Single Grip Finger Grip Cylinder.
7. Squeeze Cylinders.

The 4 & 5 Bank Valves control:

1. Pallet Drop
2. Pallet Load
3. Pallet Rotate.
4. Forks 'UP-DOWN'.
5. Index Conveyor
6. Eject Cylinder.
7. Gate.
8. Cut-Off Motor
9. Conveyor – 'ON'.

Single Control Valve.

10. Cutter Control Valve – No Control Handle
Located on the right hand side of the frame.



CAUTION

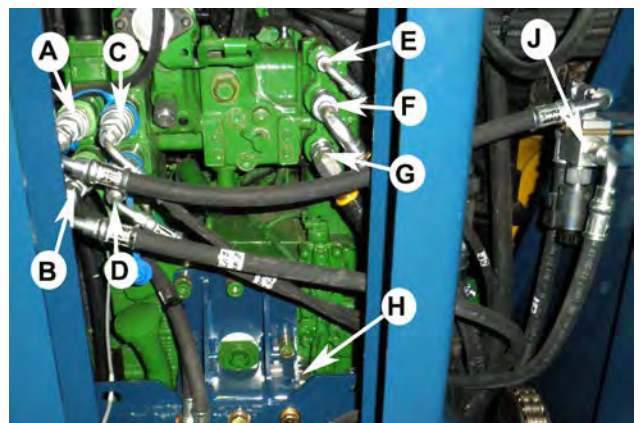
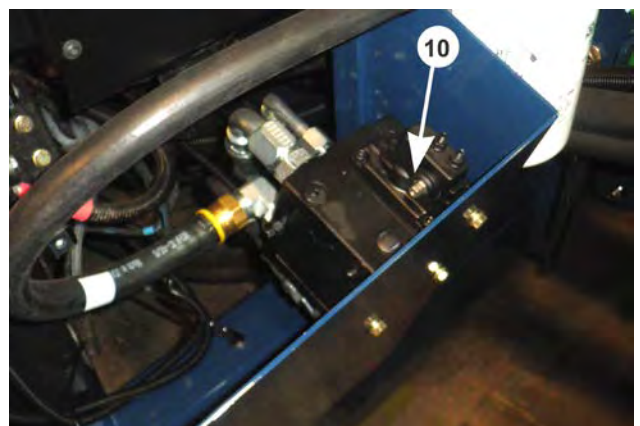
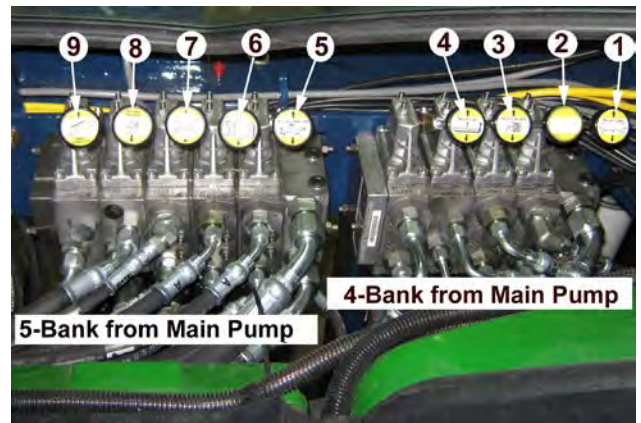
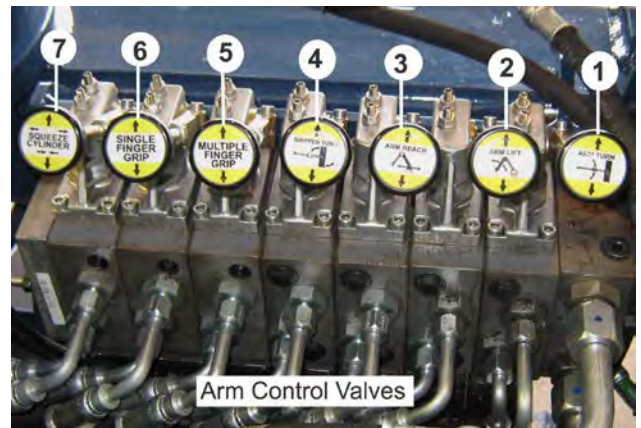
To prevent possible personal injury:

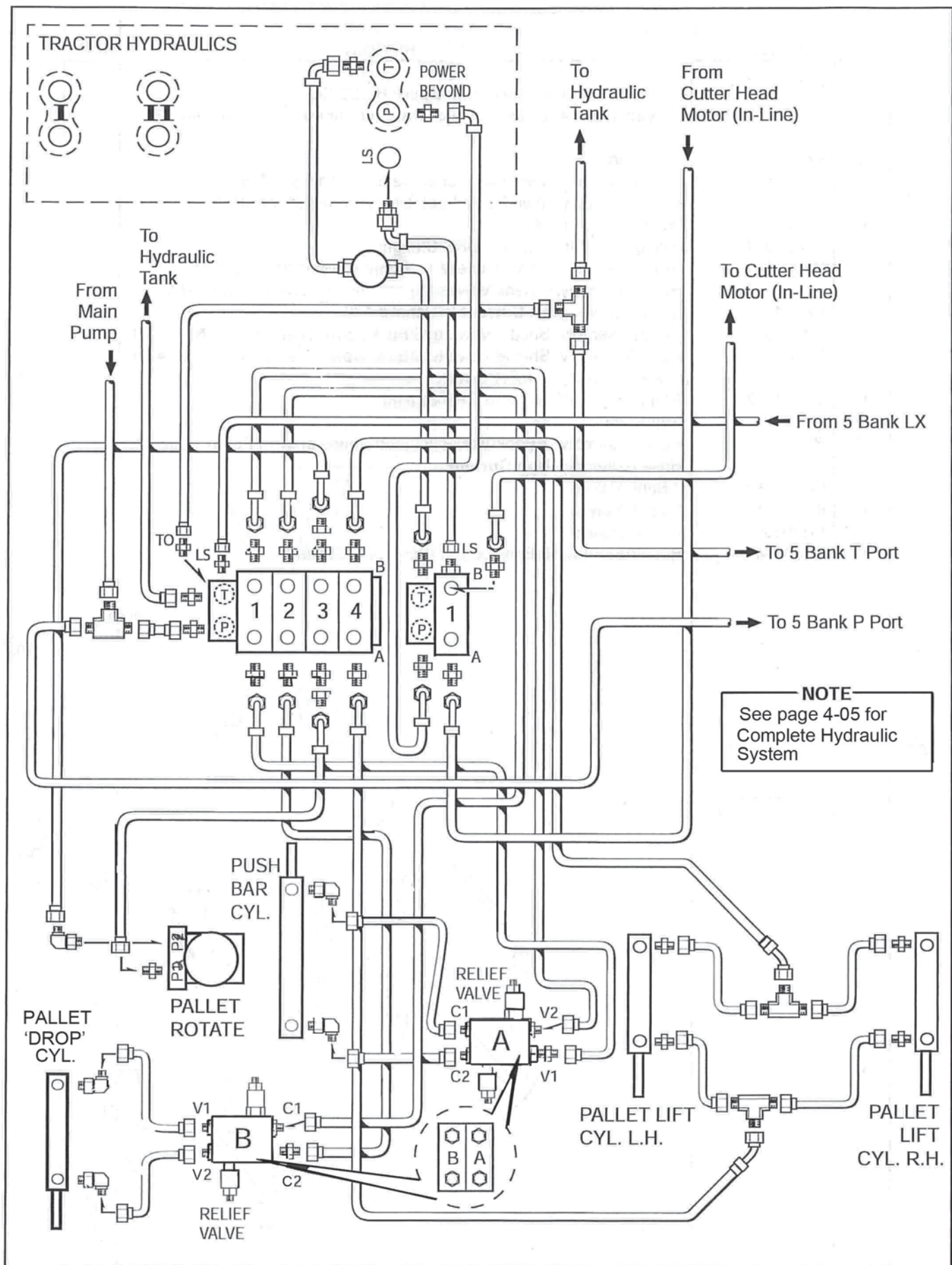
Do not attempt to manually operate this valve

The following functions are powered from the Tractor Hydraulic System.

(See Hydraulic System Diagram).

- Port 'A' Conveyor 'DOWN'.
- Port 'B'. Conveyor 'UP'.
- Port 'C' Retract Depth Cylinder. (Increase thickness).
- Port 'D' Extend Depth Cylinder. (Decrease thickness).
- Port 'E'. Load Sense to Cutter Control Valve.
- Port 'F'. Pressure to Cutter Control Valve.
- Port 'G'. Return from Cutter Control Valve.
- Port 'H'. Return from Lift Cylinder Solenoid Relief Valve 'J', and Auto Steer Valve Block.



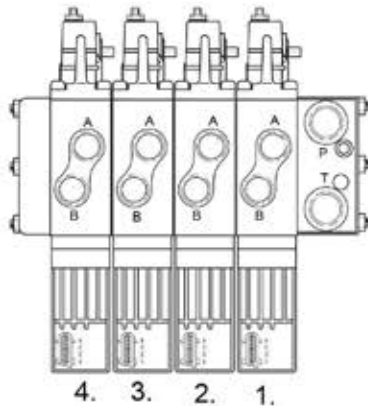


DOUBLE SIDED PALLET INJECTOR HYDRAULIC CONNECTIONS
Refer to Page 4-05 for complete Hydraulic System.

Electrical System.

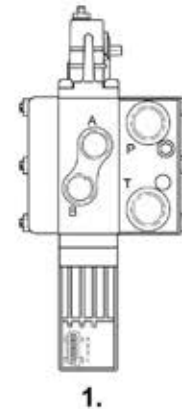
PVG. Control Valves - Electrical Connections from the Main Control Box.

4-Bank PVG Control Valves



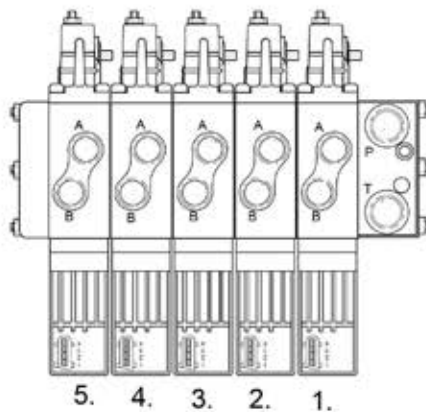
1. Push Bar.
2. Pallet 'Load'.
3. Pallet 'Rotate'
4. Pallet 'Lift'

1-Bank PVG Control Valves (From Tractor).



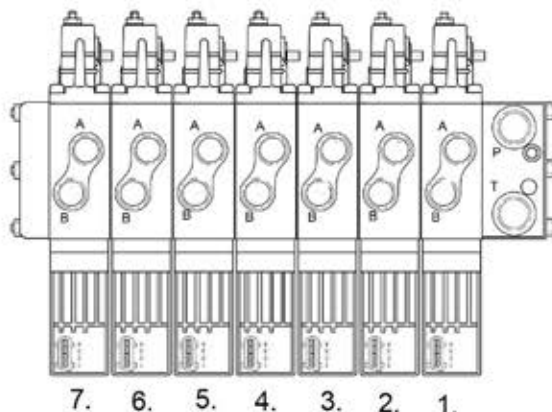
1. Cutter Motor

5-Bank PVG Control Valves.



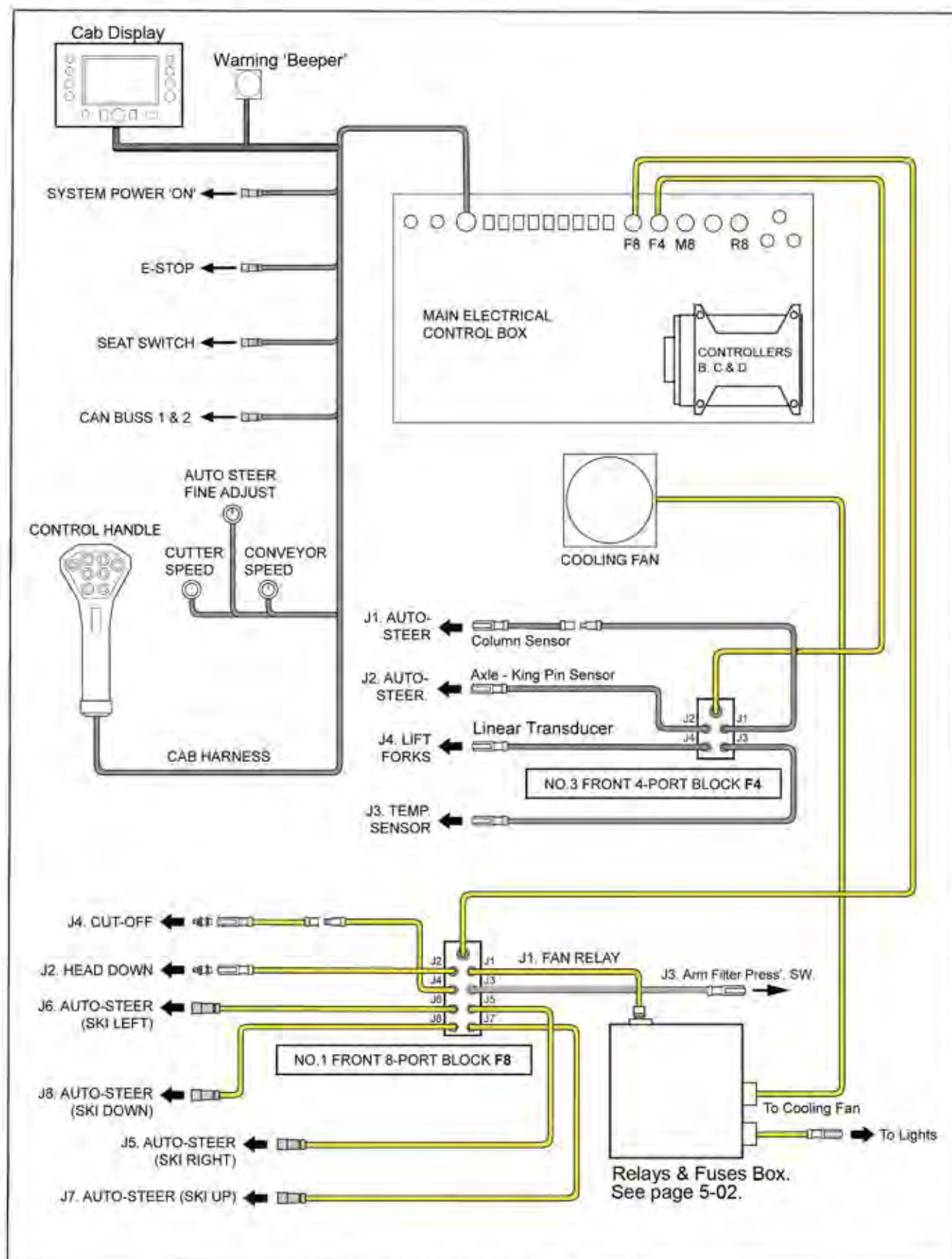
1. Index Conveyor.
2. Bad Roll Eject.
3. Rear Gate.
4. Cut-Off.
5. Conveyor.

7 - Bank PVG Control Valves.

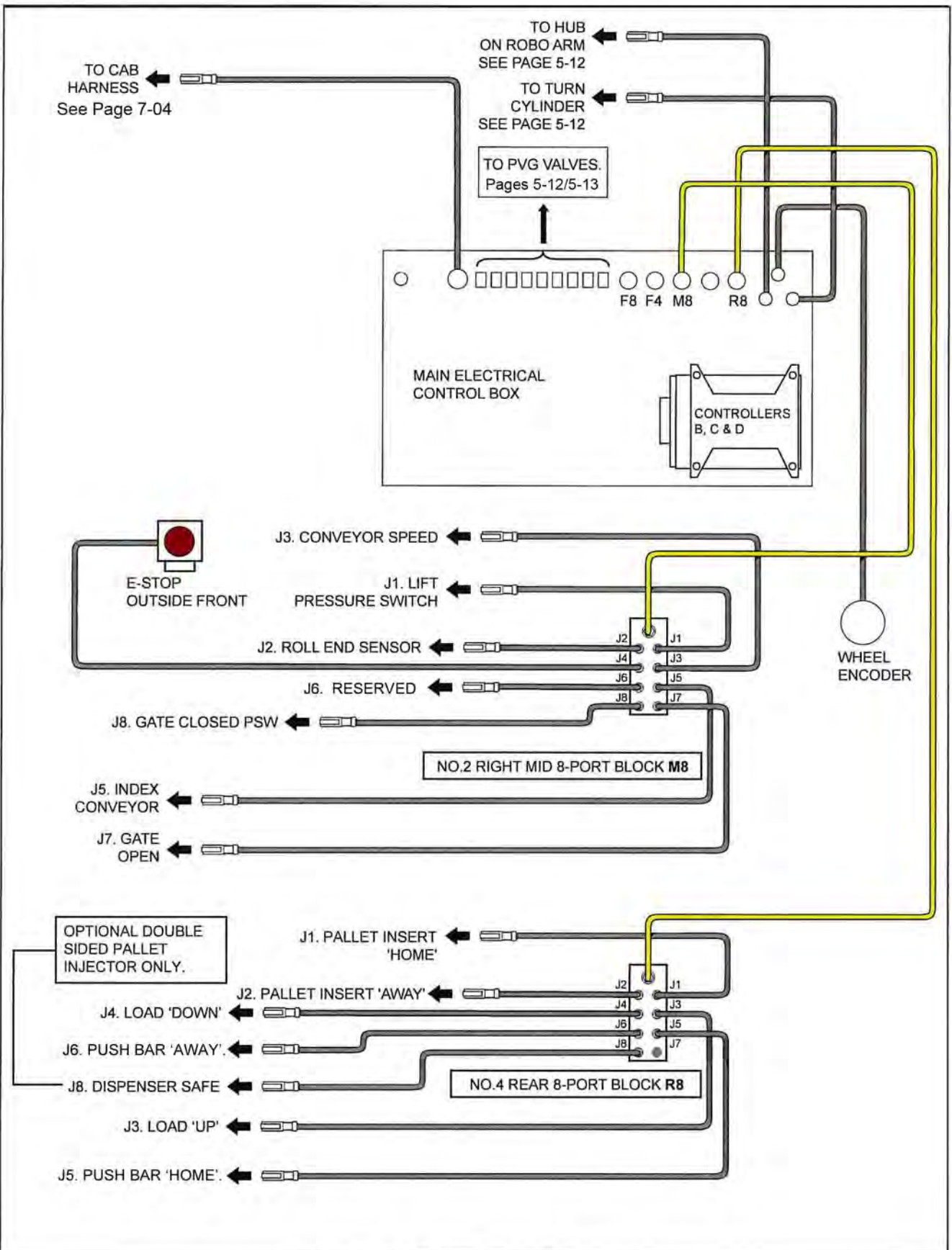


1. Arm Rotate.
2. Arm Lift.
3. Arm Reach.
4. Gripper Head - Rotate.
5. Multi Grip.
6. Single Grip.
7. Squeeze.

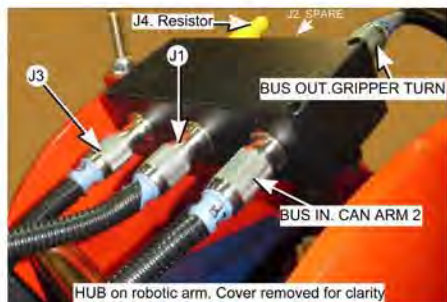
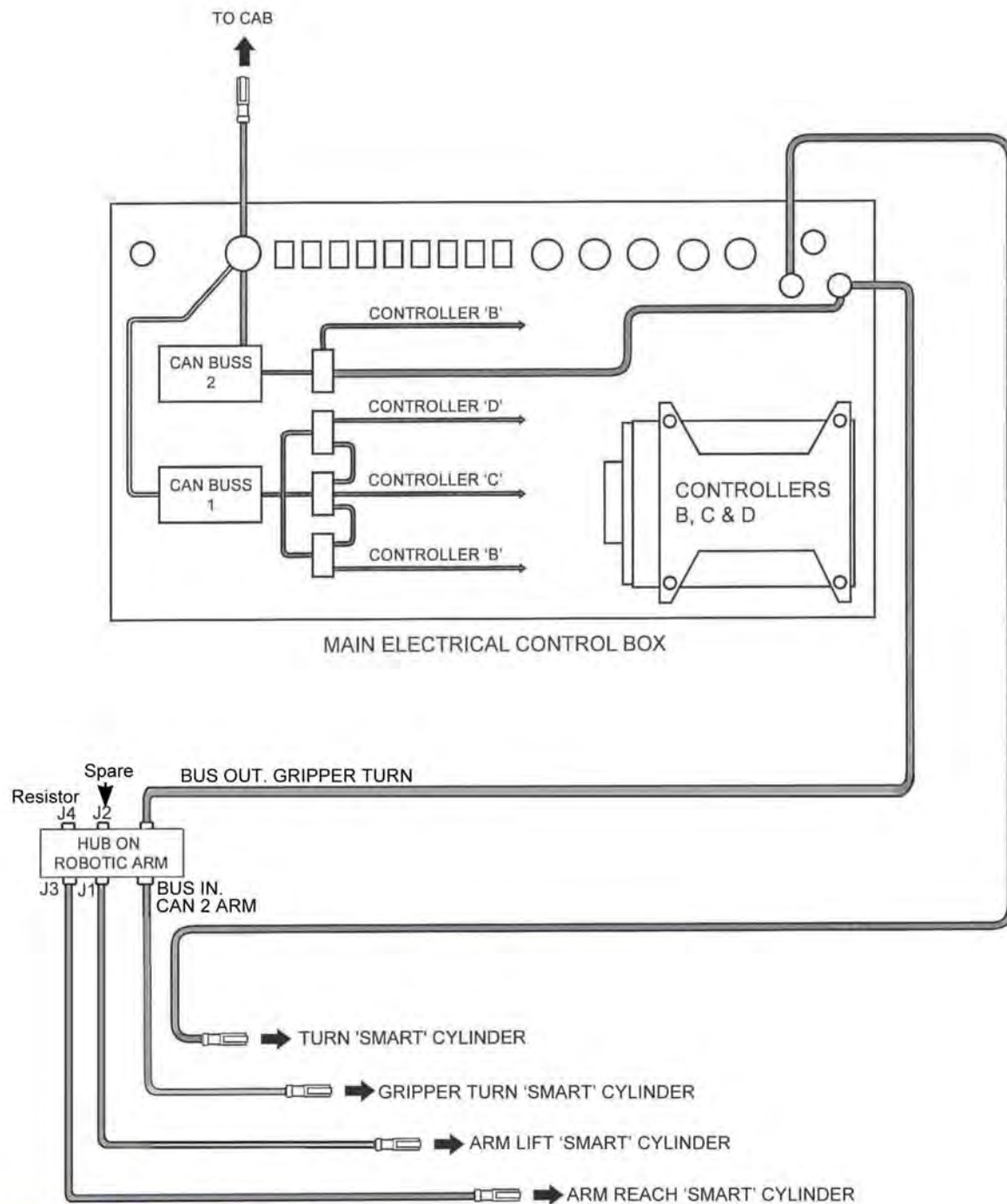
ELECTRICAL SYSTEM



ELECTRICAL SYSTEM DIAGRAM. Sheet 1



ELECTRICAL SYSTEM DIAGRAM. Sheet 2



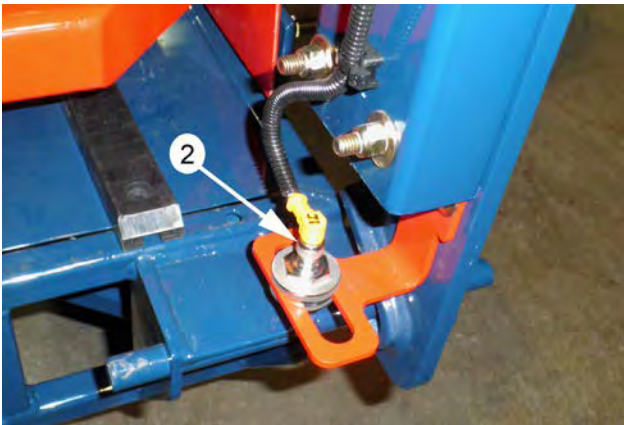
Rear 8-Port Block (R8), and PROX Sensors.



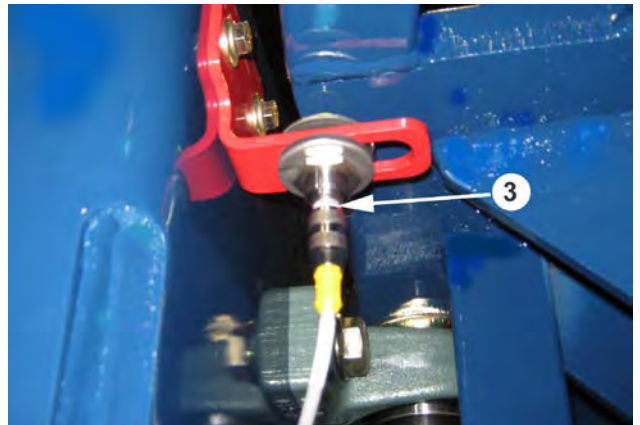
Rear 8-Port Block – R8.



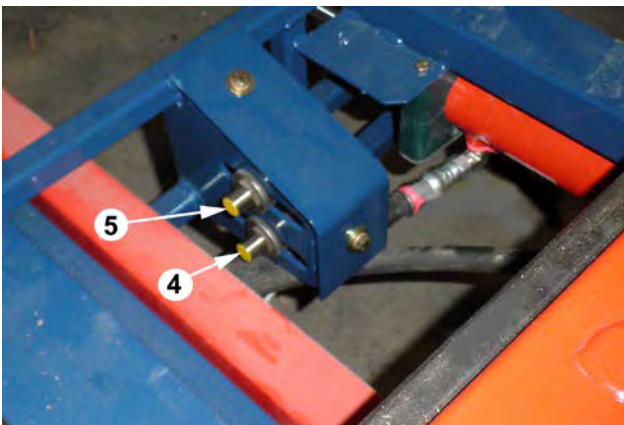
1. Pallet Insert 'AWAY'.



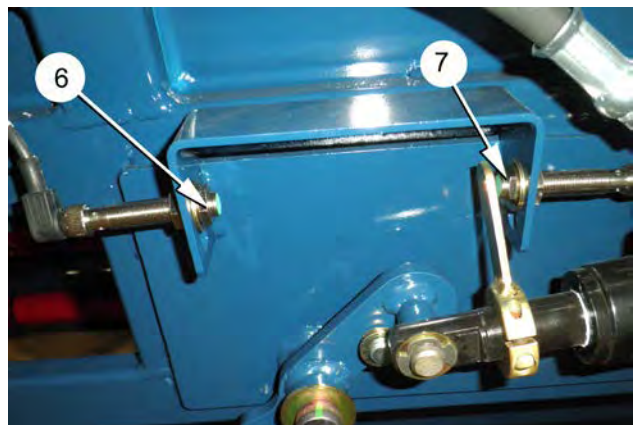
2. Pallet Insert 'Home'.



3. Dispenser 'HOME'.



4. Push Bar 'HOME'. 5. Push Bar 'AWAY'



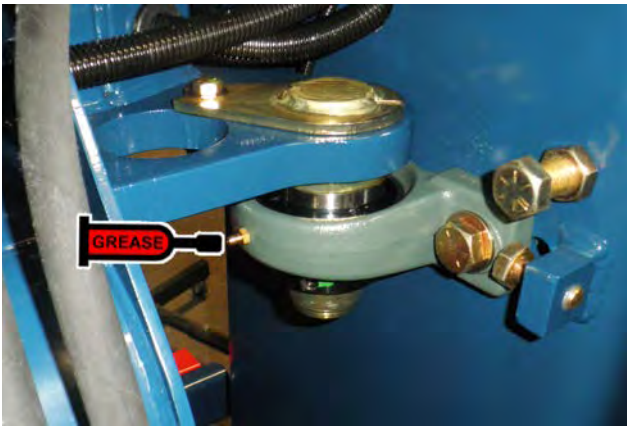
6. Paddles 'UP' 7. Paddles 'DOWN'.

IMPORTANT

Check regularly the Sensor Cable connections for tightness.
Clean dirt and debris from the face of the Sensors.
The 'Gap' from Sensor to Target must not exceed ¼ inch.

DOUBLE SIDED PALLET INJECTOR

Pallet Injector Pivot Bearings – Lubrication.



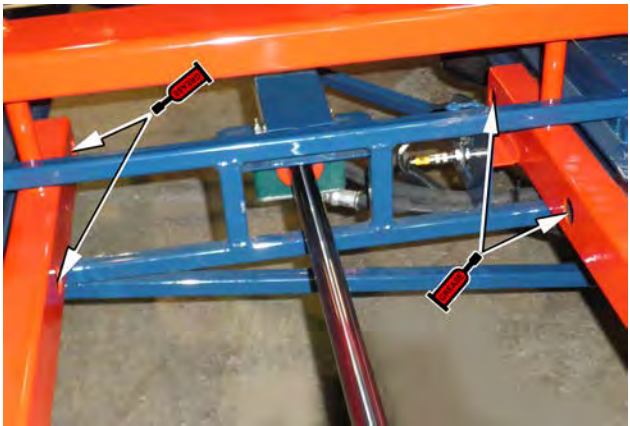
Lower Pivot Bearing.



Top Pivot Bearing.



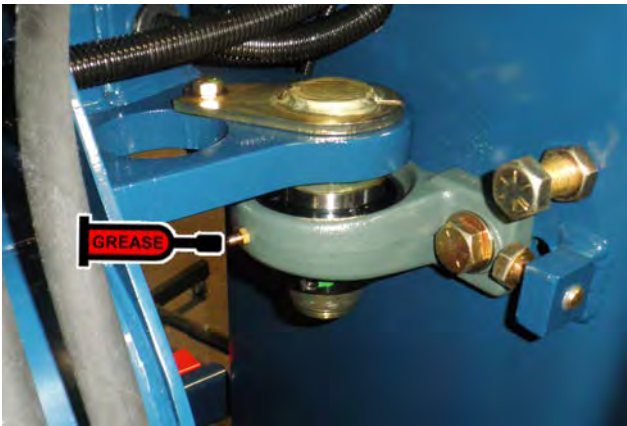
Pallet Retainer Flap. (Two Places. Bottom shown).



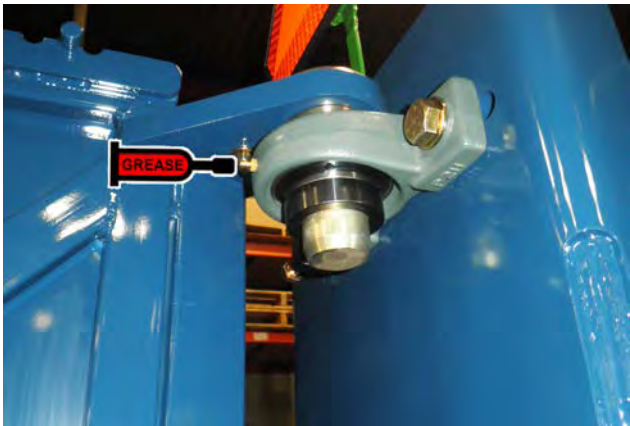
Push Bar Bearings.

DOUBLE SIDED PALLET INJECTOR

Pallet Injector Pivot Bearings – Lubrication.



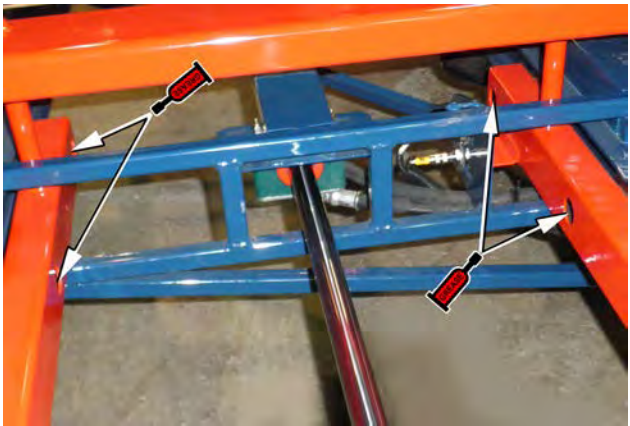
Lower Pivot Bearing.



Top Pivot Bearing.



Pallet Retainer Flap. (Two Places. Bottom shown).



Push Bar Bearings.



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