HARRISTON PICK POTATO PLANTER

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2005 RAVEN 662

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HARRISTON PICK PLANTER RAVEN 662 ALL ELECTRICAL CONNECTIONS MUST BE MADE DIRECTLY TO BATTERY

INITIAL PROGRAM US = Acres SP2 = Radar LI = For Potato Planter C - P = Pulse Width Modulated Valve (PWM)CONSOLE SETTINGS BOOM CAL = Row Spacing (") x Number of Rows SPEED CAL = 600 (Initial Setting) METER CAL Product 1 4 Row Planter =6272 6 Row Planter =4181 8 Row Planter = 3136 VALVE CAL = 23Product 2 (Granular) = 23 Product 2 (Liquid) = 2123RATE CAL 1 & 2 = Chart on reverse side DATA MENU Rate Alarm = ON Display Smoothing = ON Off Rate Percent = 30 High PWM Offset = 160 Low PWM Offset = 36 PWM Frequency = 122 Planter Rows = Number of Planter Rows Seed GAP = 16PWM Preset Offset = 75

		Row Spacing (")			
		34	36	38	40
	5	369.0	348.5	330.1	313.6
	6	307.5	290.4	275.1	261.4
	7	263.6	248.9	235.8	224.0
	8	230.6	217.8	206.3	196.0
	9	205.0	193.6	183.4	174.2
(,,)	10	184.5	174.2	165.1	156.8
ng	11	167.7	158.4	150.1	142.6
aci	12	153.7	145.2	137.6	130.7
Sp	13	141.9	134.0	127.0	120.6
eq	14	131.8	124.5	117.9	112.0
Se	15	123.0	116.2	110.0	104.5
	16	115.3	108.9	103.2	98.0
	18	102.5	96.8	91.7	87.1
	19	97.1	91.7	86.9	82.5
	20	92.2	87.1	82.5	78.4
	21	87.9	83.0	78.6	74.7
	22	83.9	79.2	75.0	71.3

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1 INTRODUCTION

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

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

This manual covers the 2, 4, 6, and 8 row models. Differences are covered and explained where appropriate.

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



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

2 SAFETY

SAFETY ALERT SYMBOL

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

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



Why is SAFETY Important to you?

3 Big Reasons

SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING**, AND **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guidelines: Accidents Disable and Kill Accidents Cost Accidents Can Be Avoided

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

WARNING - A specific hazard or unsafe practice, which COULD result in severe personal injury or death if proper precautions are not taken.

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

SAFETY

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

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

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

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

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

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

Think SAFETY! Work SAFELY!

2.1 GENERAL SAFETY

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



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

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



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

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



- 5. Install and secure all guards before starting.
- 6. Do not allow riders.

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



8. Stop tractor engine, lower machine to the ground, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.

9. Clear the area of people, especially small children, before starting the unit.

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

2.2 OPERATING SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, repairing, unplugging, or filling.

2. Do not allow riders.

3. Install and secure all guards and shields before starting or operating.

4. Keep hands, feet, hair, and clothing away from moving parts.

5. Stop tractor engine, lower machine to the ground, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging, or filling.

6. Place all tractor controls in neutral before starting.

7. Operate machine only while seated on the tractor seat.

8. Clear the area of bystanders, especially small children, before starting.

9. Keep all hydraulic lines, fittings, and couplers tight and free of leaks before using.

10. Clean reflectors, slow moving vehicle sign, and lights before transporting.

11. Add extra lights and use pilot vehicle when transporting during times of limited visibility.

12. Use hazard flashers on tractor when transporting.

13. Install safety chain when attaching to tractor.

14. Follow chemical manufacturers' handling and safety instructions exactly when using chemicals with machine.

15. Review safety instructions with all operators annually.

2.3 MAINTENANCE SAFETY

1. Follow all the operating, maintenance, and safety information in the manual.

2. Support the machine with blocks or safety stands when changing tires or working beneath it.

3. Stop tractor engine, lower machine to the ground, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging, or filling.

4. Make sure all guards are in place and properly secured when maintenance work is completed.

5. Never wear ill-fitting, baggy, or frayed clothing when working around or on any of the drive system components.

6. Before applying pressure to a hydraulic system, make sure all lines, fittings, and couplers are tight and in good condition.

7. Install safety rod and pin securely in position on hitch cylinder frame before working under frame.

8. Relieve pressure from hydraulic circuit before servicing or disconnecting from tractor.

9. Keep hands, feet, hair, and clothing away from moving or rotating parts.

10. Clear the area of bystanders, especially small children, when carrying out any maintenance and repairs or making adjustments.

11. Wear appropriate protective gear when contacting chemical handling components on machine.

2.4 CHEMICAL SAFETY

1. Some agricultural chemicals are among the most toxic substances known to man. Minute quantities can contaminate clothing, machinery, the workplace, and the environment. Follow the chemical manufacturers' instructions exactly. Death can result from their improper use.

2. Misuse, including excessive rates, uneven application, and label violations, can cause injury to crops, livestock, people, and the environment.

3. Do not breathe, touch, or ingest chemicals or the dust. Always wear protective clothing and follow safe handling procedures.

4. Follow the manufacturers' instructions for chemical storage. Avoid unnecessary storage by purchasing only the quantity needed for the crop year.

5. Keep all chemicals out of the reach of children and away from livestock and animals.

6. Store chemicals only in their original containers in a locked area.

7. Check with local authorities regarding the disposal of small quantities of chemicals, chemical containers and wash water.

8. Do not burn the containers or leave them lying in the field or ditches. Take them to your local container disposal site.

9. Wash thoroughly before eating. Use detergent to remove all chemical residue. Rinse carefully and dry with disposable towels.

10. Do not eat in the field where chemicals are being applied.

11. In case of chemical poisoning, get immediate medical attention.

12. Know the Poison Control Emergency telephone number for your area before using agricultural chemicals.

United States – 1-800-222-1222 Alberta – 1-800-332-1414 Manitoba – (204)-787-2591 Ottawa – 1-800-267-1373

13. Thoroughly wash clothing and equipment contaminated by chemicals.

14. Wash the applicators immediately after field work. Dispose of wash water in an environmentally safe manner. Wash water can contaminate the soil or a clean water supply.

2.5 HYDRAULIC SAFETY

1. Make sure that all components in the hydraulic system are kept in good condition and are clean.

2. Replace any worn, cut, abraded, flattened, or crimped hoses and metal lines.

3. Do not attempt any makeshift repairs to the hydraulic lines, fittings, or hoses by using tape clamps, or cements. The hydraulic system operates under extremely high pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.

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



5. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.

6. Before applying pressure to the system, make sure all components are tight and that lines, hoses, and couplings are not damaged.

2.6 TRANSPORT SAFETY

1. Make sure you are in compliance with all local regulations regarding transporting equipment on public roads and highways.

2. Make sure the SMV (Slow Moving Vehicle) emblem and all the lights and reflectors that are required by the local highway and transport authorities are in place, are clean, and can be seen clearly by all overtaking and oncoming traffic.

3. Do not allow anyone to ride on the Planter or tractor during transport.

4. Do not exceed 32 km/h (20 mph). Reduce speed on rough roads and surfaces.

5. Do not transport with a full seed or fertilizer tank.

2.7 STORAGE SAFETY

1. Store away from areas of human activity. Do not permit children to play on or around the stored machine.

2. Make sure the unit is sitting, or blocked up firm and solid and will not tip or sink into a soft area.

3. Cover with a weather - proof tarpaulin and tie down securely.

2.8 TIRE SAFETY

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion, which may result in serious injury or death.

2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.

3. Have a qualified tire dealer or repair service perform required tire maintenance.

2.9 ASSEMBLY SAFETY

1. Assemble in an area with sufficient space to handle the largest component and access to all sides of machine.

2. Use only lifts, cranes, jacks, and tools, with sufficient capacity for the load.

3. Use two people to handle the large bulky components.

4. Do not allow spectators in the working area.

2.10 SAFETY DECALS

1. Keep safety decals and signs clean and legible at all times.

2. Replace safety decals and signs that are missing or have become illegible.

3. Replaced parts that displayed a safety sign should also display the current sign.

4. Safety decals or signs are available from your Dealer Parts Department.

HOW TO INSTALL SAFETY DECALS:

1. Be sure that the installation area is clean and dry.

2. Decide on the exact position before you remove the backing paper.

3. Remove the smallest portion of the split backing paper.

4. Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.

5. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.

6. Small air pockets can be pierced with a pin and smoothed out using the piece of decal backing paper.

2.11 SIGN-OFF FORM

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

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

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

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

SIGN OFF FORM

Date	Employees Signature	Employers Signature



3 SAFETY DECAL LOCATIONS

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

5



1. Read Operator's Manual before using machine.

2. Stop tractor engine, lower machine to the ground place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging, or filling.

3. Install and secure all guards before starting.

4. Keep hands, feet, hair and clothing away from moving parts.

5. Do not allow riders.

6. Keep all hydraulic lines, fittings, and couplers tight and free of leaks before using.

7. Clean reflectors, SMV, and lights before transporting.

8. Install safety rod and pin securely in position on hitch cylinder frame before working under frame or transporting machine.

9. Add extra lights and use pilot vehicle when transporting during items of limited visibility.

10. Use hazard flashers on tractor when transporting.

11. Install safety chain when attaching to tractor.

12. Follow chemical manufacturers' handling and safety instructions exactly when using chemicals with machine.

13. Review safety instructions with all operators

 A WARNING

 Image: Constraint of the second second

11



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



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





16



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





12

6



CHECK TORQUE ON BOLTS AFTER FIRST TEN HOURS OF OPERATION

ATTENTION:

ANY ALTERATION TO THE HYDRAULIC DRIVE SYSTEM VOIDS WARRANTY

93020

093006	Warning Falling Hazard
080021	Decal Yellow Reflector
080020	Decal Red Reflector
093057	Decal Harriston Large
093001	Decal Caution (Hitch)
093052	Decal Attention Check Torque
093056	Decal Made with Pride
093003	Decal Missing Shield
093055	Decal Harriston Quality
093058	Decal Slow Moving Sign
093005	Decal Warning High Pressure
093020	Attention Alteration to Hydraulic
093016	Decal Warning Falling Hazard Small
093009	Serial Number Plate
093004	Danger Toxic Chemical
093018	Warning – Empty Seed Tank for Transport
093044	Warning – Moving Parts Hazard
093019	Warning – Rotating Parts Hazard
	093006 080021 080020 093057 093001 093052 093056 093003 093055 093055 093005 093005 093016 093009 093016 093004 093018 093044 093019

4 **OPERATION**



1. Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, repairing, unplugging, or filling.

2. Do not allow riders.

3. Install and secure all guards and shields before starting or operating.

4. Keep hands, feet, hair, and clothing away from moving parts.

5. Stop tractor engine, lower machine to the ground, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging, or filling.

6. Place all tractor controls in neutral before starting.

7. Operate machine only while seated on the tractor seat.

8. Clear the area of bystanders, especially small children, before starting.

9. Keep all hydraulic lines, fittings, and couplers tight and free of leaks before using.

10. Clean reflectors, SMV, and lights before transporting.

11. Add extra lights and use pilot vehicle when transporting during times of limited visibility.

12. Use hazard flashers on tractor when transporting.

13. Install safety chain when attaching to tractor.

14. Follow chemical manufacturers' handling and safety instructions exactly when using chemicals with machine.

15. Review safety instructions with all operators annually.

4.1 TO THE NEW OPERATOR OR OWNER

Harriston potato planters are designed to quickly and efficiently plant potatoes with almost any row spacing and in a variety of seed placement spacings. The ground or hydraulic drive ensures accurate placement of seed at any reasonable speed.

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

4.2 PRINCIPLE COMPONENTS



The Harriston potato planter uses a large hopper (A) to carry cut potatoes over the field for planting. A small hydraulically powered feed chain (B) moves the seed into the seed bowl (C) next to the planting wheels (D). An electrical switch in the bowl activates the potato chain when more seed is required.

Ground driven tires or a hydraulic system drive the planting wheels through a series of adjustable chains and sprockets used to set the spacing between each plant. A series of spring-loaded picks (E) select a potato as it moves through the bowl. As the picker wheels (D) turn, the picks are pulled back when they contact a cam on the lower portion of the arc. The potato is released and drops into the ground.

The shoe (G) ahead of the planting wheel opens the ground to receive the seed. Discs (I), behind the row unit, close the seedbed and start the hilling process.

Adjustable gauge wheels (G) allow the operator to set the depth of the seed.

Before starting to work, all operators should familiarize themselves with the location and function of the controls on the planter and tractor.

The Harriston Planter is offered with four different drive systems: Raven 662 Hydraulic, Raven 760 Hydraulic, Dickey-John CCS100, and Ground (Mechanical)

ALL ELECTRICAL CONNECTIONS MUST BE MADE DIRECTLY TO THE BATTERY WITH 'CLEAN' LEADS. GROUND WIRE MUST BE FREE FROM CORROSION

ANY SYSTEM MALFUNCTIONS CAUSED BY CONNECTION OF ELECTRICAL LEADS TO ANY OTHER POWER SOURCE WILL NOT BE COVERED BY HARRISTON INDUSTRIES

4.3 PRE-START AND BREAK IN

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

PRE-START INSPECTION

- 1. Read the Operator's Manual
- 2. 2. Tighten wheel bolts to 140 ft-lbs (24 N.m) torque
- 3. 3. Check that tires are inflated to their specified pressure.
- 4. 4. Check that the hydraulic lines and electrical harness are routed where they will not contact moving parts. Be sure all components are clipped, taped, or tied securely in place.
- 5. 5. Check that all guards are installed and secured.
- 6. 6. Tighten all mounting bolts on rear ladder and loading platform if so equipped.
- 7. 7. Check that all picks are in place and straight. Install or straighten as required.
- 8. 8. Rotate each picker wheel to be sure that the overrunning clutch and drives are functioning properly. Lubricate or adjust as required.
- 9. 9. Check that all required nuts and bolts are installed and tightened to their specified torque.
- 10. 10. Lubricate the machine.

AFTER OPERATING FOR 2 HOURS

- 1. Re-torque all wheel bolts.
- 2. Check tire pressure.
- 3. Re-torque all other fasteners and hardware.
- 4. Check that no hoses are being pinched, crimped, or are rubbing. Reroute as required.
- 5. Check that the wiring harness is not being pinched, crimped, or rubbing. Reroute as required.
- 6. Check the tension and alignment of all drive and feed chains. Adjust as required.
- 7. Check the condition of the picks on each wheel. Replace or straighten as required.
- 8. Lubricate the machine.

AFTER OPERATING FOR 10 HOURS

- 1. Re-torque all wheel bolts.
- 2. Re-torque all fasteners and hardware.
- 3. Check the routing of hydraulic lines and the wiring harness. Reroute as required to prevent pinching, crimping, binding or rubbing.
- 4. Check the tension and alignment of all drive and conveyor chains. Adjust as required.
- 5. Check the condition of the picks on each wheel. Replace or straighten as required.
- 6. Go to the normal Service and Maintenance schedule.

RE-TORQUE WHEEL BOLTS EVERY 50 HOURS.

4.4 PRE OPERATION CHECKLIST

Efficient and safe operation of the Harriston planter requires that each operator reads and understands the operating procedures and all related safety precautions outlined in this section. A pre-operation checklist is provided for the operator. It is important for both personal safety and maintaining the good mechanical condition of the machine that this checklist is followed.

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

- 1. Lubricate the machine per the schedule outlined in the Maintenance Section.
- 2. Check the drives for entangled material.
- 3. Check that the picks are not broken or bent. Replace or straighten as required.
- 4. Check the chains and sprockets for proper tension and alignment. Adjust as required.
- 5. Ensure that all bearings turn freely.
- 6. Make sure all guards and shields are in place secured, and functioning as designed.
- 7. Check that all hydraulic fittings and connections are tight and in good condition.

4.5 EQUIPMENT MATCHING

The Harriston potato planter was designed to be used on large 2-wheel drive or front wheel assist agricultural tractors. To ensure good field performance, the following list of specifications must be met.:

HYDRAULICS

The towing tractor must be capable of 12 gpm @ 2000 p.s.i. to operate hydraulic drive. Additional flow must be provided for the following: Ground Drive (4 gallons) Rear Lift (3 gallons) Markers (2 gallons) Fertilizer (5 gallons) Hydraulic Drive (12 gallons) Air Insecticide (4 gallons)

THREE POINT HITCH

With 2 point semi-mount attaching systems, a Cat III 3 point is recommended.

HORSEPOWER

		Rolling,	0 Delint
	Level, Firm	Son	3 Point
_	Soil	Soil	Lift Cap.
4 Row	90 HP	110 HP	6000 LBS.
4 Row W/ FERT.	110 HP	130 HP	8500 LBS.
6 Row	140 HP	160 HP	8000 LBS.
6 Row W/ FERT.	160 HP	180 HP	11000 LBS.
8 Row	165 HP	200 HP	10000 LBS.
8 Row W/ FERT.	200 HP	225 HP	13500 LBS.

TIRE CONFIGURATION

It is recommended that a tire width be used on the tractor that will allow the tire footprint to fit between the rows being planted. The row spacing of the Planter can be adjusted. Tires that are too wide for the available space will compact the seedbed and affect plant growth.

TRACTOR WEIGHT

By following the recommendations for tractor power, the tractor will have sufficient weight to provide stability for the unit during field operations or transporting. It is also recommended that each tractor be equipped with a full complement of suitcase weights on the front of the tractor. This will provide the required weight on the front for turning as well as extra traction if equipped with front wheel assist.

ELECTRICAL

Each machine requires a 12 volt 20 amp power supply to operate the solenoid for the feed chain into the seed bowl. An additional 12 volt 5 amp supply is required for the hydraulic drive models. The switch is routed into the cab for easy access during operation

4.6 RAVEN 662 HYDRAULIC CONTROL SYSTEM

The hydraulic drive planter is a single series hydraulic system controlled by an electronic pulse width modulated (PWM) control valve. Hydraulic oil flow and pressure is supplied by the tractor. This valve controls how fast the picker wheels turn, which in turn, determines seed spacing. The system can be operated as either an open or closed system.

PRESSURE- FLOW COMPENSATED SYSTEM

Most new tractors use a pressure flow compensated hydraulic system. Flow is adjusted with the tractor flow control. It is recommended that flow be set to deliver only the g.p.m. required to operate the planter at the desired rate and speed, usually 10-15 g.p.m. is sufficient. Excess flow could damage the planter control system. When planting, the pressure will be the tractor operating system pressure (usually 300 p.s.i.) plus the pressure required to operate the planter. This varies greatly depending on planter size and configuration.

With the planter stopped, tractor running, and hydraulic valve engaged, pressure will return to tractor operating pressure (300-600 p.s.i) if the bypass valve (A) is in the <u>OPEN</u> (HANDLE IS IN LINE WITH THE VALVE BODY) position. When the bypass valve is in the <u>CLOSED</u> (HANDLE IS 90° TO THE VALVE BODY) position, there will be no flow when planter is stopped and hydraulics engaged, but the pressure will be as high as 3000 p.s.i. between the tractor valve and planter control valve. To reduce the chance of injury from a blown hydraulic hose or fitting and valve leakage (which causes planter creep), Harriston recommends the bypass valve be open on compensated systems.

These systems have a very high flow, some in excess of 40 g.p.m. To reduce overheating and possible damage to planter hydraulic system, set the flow to deliver only the g.p.m. to operate the planter. Some compensated hydraulic systems have a pressure-sensing line available as an option. Consult your tractor dealer about this option.

When the planter is not moving, or operating in manual mode, there will be no flow or pressure after the pwm valve (B). When the planter begins to move, or the increase/decrease switch is moved to start the planter, the control console receives a signal from the radar gun and begins to open the valve. Oil will begin to flow from the CF port (C) of the valve to the pick wheel hydraulic motor (D). As the hydraulic motor begins to turn, oil will flow from the motor to flow control port IN (E) and to the feedbox motors (F). See Page 59 for more information on motor solenoids / oil flow.

If the feed box motor solenoid is open (no potatoes contacting bowl switch), oil will bypass the feedbox motors in the valve block below the solenoid and continue to the other feedbox motors. If the feed box motor solenoid is closed (potatoes contacting switch), oil will flow through and turn the motor. Any motor that has a closed solenoid will turn as long as the main drive motor is turning. Set the flow control on #2 or #3 when starting. See page 41 for setting bowl seed level. Oil flows from the last feedbox motor and returns to the tractor.

Flow or Gallons Per Minute (G.P.M) is regulated by the tractor flow control. Flow should be set so that sufficient flow is provided to operate planter at the desired planting speed. Usually this will be 10 to 15 g.p.m or less. Flow should never be above 15 g.p.m. A check valve is located after the hydraulic tip on the tractor pressure line to prevent the planter from running in reverse.

RAVEN 662 CONTINUED

OPEN HYDRAULIC

In an OPEN SYSTEM, the bypass valve is <u>OPEN</u> (Handle is in line with the valve body). In an open hydraulic system, the tractor usually is not equipped with any type of built-in flow control. The flow (g.p.m.) will be whatever the tractor provides on the hydraulic valve being used. No flow control or restrictor should be used between the tractor valve and the planter system. A restrictor or flow control used on an open system could cause overheating or damage to the hydraulic system.

There will be very little hydraulic pressure when the planter is not operating and the control valve on the tractor is open (usually 150 p.s.i or less). In the operating or manual mode, pressure will be whatever is required to operate the planter at the time. This will vary greatly depending on planter size and configuration (usually 1200-2200 p.s.i).

Any flow beyond what is required to operate will return to the tractor through the bypass line. It is recommended that a flow of 10 to 15 g.p.m. be provided. If tractor provides less than 10 or more than 15 g.p.m. consult your tractor dealer to have the flow adjusted. Open hydraulic systems are generally found on older or smaller tractors.

CLOSED SYSTEM

In a CLOSED SYSTEM, the bypass valve is **CLOSED** (handle is 90° to the valve body). With the tractor running and hydraulic valve engaged, there is always high system pressure from the tractor to the pwm valve (B), with a typical pressure of 2250 to 3000 p.s.i.





4.8 RAVEN 662 CONTINUED

PULSE WIDTH MODULATED VALVE

The pulse width modulated valve (PWM) uses electric current to raise and lower a valve, which controls the amount of oil flow. It is usually mounted on the center crossmember.

The main components of the valve are the valve body, spool, compression spring, electronic solenoid, and an actuator rod. The valve also contains a pressure compensator to keep oil flow steady regardless of pressure. A compression spring holds the spool in the closed position. The solenoid and operating rod are located on the opposite end of the spool from the compression spring. When the electronic solenoid is energized it creates a magnetic field, which pushes the operating rod against the spool. This overcomes the compression spring and the valve begins to open, allowing oil to flow from the tractor to the hydraulic drive motor. When the master switch is shut off, or ground speed stops, the compression spring closes the valve. The valve needs power to stay open. If there is any malfunction or power loss the valve will close.

The PWM Valve requires a very exact voltage to operate properly. Therefore ALL HYDRAULIC CONTROL SYSTEMS MUST BE CONNECTED TO THE BATTERY WITH A "CLEAN" POWER AND GROUND WIRE. Convenience outlets in the cab or outside the cab are NOT acceptable power sources. Radios, telephones, tractor radar, or any other electrical devices cannot be connected to the same power and ground wires. ANY SYSTEM MALFUNCTIONS CAUSED BY CONNECTION OF THE POWER AND GROUND WIRES TO ANY SOURCE OTHER THAN DIRECTLY TO THE BATTERY WILL NOT BE COVERED BY WARRANTY.

If the PWM valve fails to operate properly, use a voltage meter to check the voltage between the two lines on the valve. Disconnect the radar, and with the console in the manual position, have an assistant hold the increase/decrease switch in the increase position. **CAUTION: STAY CLEAR OF THE PICKER WHEEL TO AVOID ENTANGLEMENT**. There should be 11.6 to 12.6 volts. If this voltage cannot be maintained, check wiring harness for breaks or a loose connection. If a reading of 12 volts is found, and valve still does not work properly after performing the servicing procedure on Page 63, replace the valve.

The VALVE CAL is a two-digit number that determines how the valve will operate. The first digit is the valve response time. A lower first digit will make the valve respond faster on startup, speed change, and stopping. If the planter is slow to respond when planter starts moving, or runs when stopping, enter a smaller number. If the first digit is too low the planter may surge.

The Raven 760 system has a smoothing function that ignores minor temporary variations in the speed or mechanical operation of the planter. A rate adjustment will not occur as long as the planter is within a



percentage of the target rate for 10 seconds or less. The target rate, or "deadband" percentage, is determined by the second digit in the VALVE CAL number. The factory setting for the VALVE CAL is 23. If the planter stays within 3 percent of the target rate for 10 seconds or less no rate adjustment will be made. The system will make an immediate correction if a rate adjustment greater than 3 percent is called for due to a change in speed, or if the target rate is not returned to within 10 seconds. The "deadband" can be changed by entering a new VALVE CAL number. (21=1%, 29=9%). Setting the second digit too low may cause the planter to surge or pulsate. A number that is too high may cause sluggish operation. If the smoothing display is shut off, the valve will react to all variations.

ENCODER

The encoder counts the rotation of the shaft that drives the top drive rollers. It is a 180 pulse per revolution encoder. One revolution of the top drive roller turns the encoder shaft 1 revolution. The encoders are normally mounted on the right side of planter on the end row unit mounted directly to the top roller. It is not recommended that the encoder be moved. ANY MALFUNCTION CAUSED BY CHANGING THE ENCODER POSITION WITHOUT PRIOR APPROVAL BY HARRISTON WILL NOT INDUSTRIES BE COVERED BY WARRANTY.



RAVEN RADAR

The radar provides the console with the speed that the planter is traveling. The raven radar unit is usually mounted on the hitch for 6 & 8 row planters. On semimount or 4 row planters it should be mounted on the end crossmember. Mount the radar with the cord to the rear. The raven radar reads both to the front and the back to provide a constant signal to the console. It must be mounted 16" above the ground and horizontal to the ground. It must have 16" of clear view to the sides. **NOTE: Anything that is moving (dust, weeds, hands or feet) will cause the radar to "see movement" and send a signal to the console.**



RAVEN 662 CONSOLE

The Raven console must always be connected directly to the battery. The ground wire should be free of corrosion. The power lead must use a 'clean' line, no other accessories should be connected with it. ANY MALFUNCTION CAUSED BY IMPROPER BATTERY CONNECTION WILL NOT BE COVERED BY WARRANTY.

The Raven 662 has a seed drop monitor in the console. At this time, the monitor is used with Dickey-John sensors located on the side of the row unit. The potatoes falling through the offset area of the chute break a beam transmitted across the seed chute.

The monitor will continually sequence through each row if the power switch is turned on (with no forward movement). When planting, if all rows are functioning, the monitor will go into a passive or standby mode. When a row stops planting for a predetermined time, the failed row will be displayed in the RATE display. An alarm will also sound. The sensitivity of the monitor can be adjusted with the GAP setting in the DATA menu. The higher the GAP number the less sensitive the monitor is. The factory GAP number is 16.





Switchbox

The switchbox consists of a master switch and five product switches. The master switch controls all products and is an on/off switch.

Switches #1 and #5 are dedicated switches to the Harriston planter and may not be used for any additional products. Switch #5 controls the planter potato feedbox chains.

Switch #1 is a three-position switch (On, Off and Delay On). The "Delay On" position is used in conjunction with the planter delay dial. The delay dial allows other products to start slightly ahead of the planter. This ensures the first seeds dropped to receive fertilizer or other chemicals. The amount of delay may be set from .25 seconds to 2 seconds. Placing switch #1 in the "On" position will bypass the delay function.

Switch #5 allows the operator to shut off the potato feedbox chains. This is used to empty the bowls and row units while there are potatoes in the seed tank.



Switch #2 is dedicated to the Harriston Dry Fertilizer option - if so equipped.

Switches #3 and #4 can be used to operate additional products. Do not use these switches to operate other functions that are not controlled by the Raven console. Consult your Raven or Harriston dealer on using the switches to control other products.

NOTE: THE USE OF THESE SWITCHES TO OPERATE UNAUTHORIZED FUNCTIONS MAY AFFECT OPERATION OF THE CONTROL SYSTEM AND VOIDS ALL WARRANTY.

Harness Cables

The product cable contains the plug-ins for the seed sensors, radar, planter valve, and planter shaft sensor. The product cable plugs into the console cable. Adding another product cable can control other functions. The console cable plugs into the console and has the power leads and a lead to the switchbox. See page 23 for an illustration of cables.

4.8 RAVEN 662 INITIAL PROGRAMMING

(Pre-programmed at Harriston)

The console is initially programmed at Harriston Industries. When the console is powered off these settings should remain. If for some reason they are 'lost', the following settings must be entered in order for the Raven system to work.

If the console is powered on and "CAL" flashes in the RATE display, the console must be programmed. If an entry error is made when programming the console, do the following:

Turn the power off. Place all switches on console and console switchbox to "Off" position.

Depress and hold



while turning the power on. THIS RESETS THE CONSOLE

"CAL" will be flashing in the RATE display and the DATA display will show "US" - Volume Per Acre

RATE CAL.	
BOOM CAL 3 SPEED CAL 4 S S S S CAL 5 S S S CAL 5 S S S S S S S S S S S S S S S S S S	E RATE 1 CAL 7 7 8 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

YOU ARE NOW READY TO PROGRAM THE CONSOLE

- CF Choose between US (acres), SI (hectares), or TU (1000 sq ft). Depressing 1. will ENTER step through the options. When the display in DATA shows US, depress CE 2. Choose between SP1 (Wheel Sensor) or SP2 (Radar). Depress to step through the ENTER options. When the display in DATA shows SP2, depress CE Choose between LI (Liquid Sprayer), GR1 (Servo Valve) or GR2 (Split bed belt). Depress 3. to step through the options. When the display in DATA shows LI, depress
- 4. Choose between C-Sd (Standard Valve), C-F (Fast Valve), C-FC (Servo Valve Fast Close) or C-P (Pulse Width). Depress to step through the options. When the display in DATA shows C-P,

The display in DATA should now indicate .00

The initial programming is now complete.

CONSOLE PROGRAMMING

When entering data (numbers) into the console, the sequence is always the same.

- 1. Depress the key in which you wish to enter data (ex. boom cal).
- 2. Depress . An "E" will appear in the DATA display.
- 3. Depress the number key corresponding to the number you wish to enter. The numbers will be displayed as they are entered.
- 4. Complete the entry by depressing

BOOM CAL

The BOOM CAL number is the row spacing multiplied by the number of rows.

ENTER

C

example: 4 Row 36" = 144, 6 row 36" = 216

For uneven row spacing add the row spacings including the guess row.

- 4 Row 34" = 1366 Row 34" = 1368 row 34" = 2724 Row 36" = 1446 Row 36" = 2168 row 36" = 2884 Row 38" = 1526 Row 38" = 2288 row 38" = 3044 Row 40" = 1606 Row 40" = 2408 row 40" = 320
- 1. Depress
- 5. Depress $\Box \Box$. An "E" will appear in the DATA display.
- 6. Enter the numbers from above.
 - Depress

SPEED CAL

7.

The initial Speed Cal number when using a Raven Radar is 600.

- Depress the . Depress the . An "E" will appear in the DATA display.
 Enter the numbers from above. Depress the .
- 3. Enter the numbers from above. Depress the

On tractors equipped with an accurate speedometer, Depress the SPEED key when the tractor is moving. Tractor speed and Raven 662 speed numbers should be the same. If they are not, raise or lower SPEED CAL number until they match.

This number can be refined by completing the following steps:



4.	Set POWER switch to ON, all other switches to OFF.	Enter "0" in the	
----	--	------------------	--



5. Drive 1 mile. To achieve the most accurate calibrations, accelerate and decelerate slowly.

Do not use vehicle odometer to determine distance. Use section lines or highway markers.

6. Read the distance by depressing the

The value should be approximately 5280. If it reads between 5260-5300 the SPEED CAL is correct. If the value is not within the range, perform the following calculation:

Example: After driving a known distance of one mile, the distance on the console shows 5000.

Corrected SPEED CAL = <u>old SPEED CAL X 5280</u> distance $\frac{600 \text{ X } 5280}{5000} = 633.60 = (633)$

- 7. Enter the new number in the SPEED CAL
- 8. Recheck the new SPEED CAL by using the steps from above.

METER CAL

How the METER CAL number is derived:

Information required

- 1. Number of pulses from the encoder per revolution of the top (drive) roller.
- 2. Number of planter pick arms per pick wheel.
- 3. Number of rows

The Raven encoder 063-0171-071 has 180 pulses per revolution.

One revolution of the pick wheel turns the encoder shaft 3.345 revolutions. NOTE: this is for encoders mounted on the row unit drive shaft. This shaft is geared 3.345 to 1 in relation to the pick wheel. If the encoder is mounted directly on the hydraulic motor (not recommended) a 36 pulse per revolution must be used.

METER CAL = <u>number of pulses from encoder per 1 revolution of pick wheel X 10</u> number of planter pick arms per pick wheel X number of rows

Multiply the result of the above formula by 100 for the rate per 100 plants

Example: 4 row planter

pulses per 1 revolution = $180 \times 3.345 = 602.1$ $\frac{602.1 \times 10}{24 \times 4} = 62.72$ $62.72 \times 100 = 6272$

METER CAL: 4 ROW PLANTER=6272, 6 ROW PLANTER = 4181, 8 ROW PLANTER = 3136

		METER
9.	Depress	5
		ENTER
10.	Depress	. An "E" will appear in the DATA display.
11.	Enter the	numbers from above.
12.	Depress	ENTER .
VALVE CAL

The VALVE CAL number is 23.

The valve calibration number is used to control response time of the motor control to the change in vehicle speed. After operating the system, you may desire to refine this number.

The first digit is the valve response time. The lower the value, the faster the valve will respond on startup, speed changes, and stopping.

The second digit is the deadband number. This is the allowable difference between target and actual application rate, where rate corrections are not performed. The second digit from above indicates that planter speed can change 3% up or down in 10 seconds without a change in rate.

A value too low may cause the planter to surge or pulsate. A number too high may cause sluggish operation.

1.	Depress	VALVE CAL 6
2.	Depress	. An "E" will appear in the DATA display.
3.	Enter the	number from above.

 \subset

ENTER 13. Depress RATE CAL

The RATE CAL number is the number of plants per acre at a given seed spacing and row width. Rate 1 and Rate 2 are required to have an entry. If only one rate is to be used, enter the same rate in Rate 1 and Rate 2.

How the RATE CAL is calculated:

PLANTS PER ACRE = 43560 SQ. FT per PLANT

Example = 5" seed spacing for a 36" row spacing

SQ. FT PER PLANT =
$$\frac{5 \times 36}{144}$$
 = 1.25

PLANTS PER ACRE = 43560 = 34848 1.25

RATE CAL = 34848 = 348.48 100

THE FOLLOWING PAGE CONTAINS A CHART FOR SEED SPACING

	34	36	38	40
5	369.0	348.5	330.1	313.6
6	307.5	290.4	275.1	261.4
7	263.6	248.9	235.8	224.0
8	230.6	217.8	206.3	196.0
9	205.0	193.6	183.4	174.2
10	184.5	174.2	165.1	156.8
11	167.7	158.4	150.1	142.6
12	153.7	145.2	137.6	130.7
13	141.9	134.0	127.0	120.6
14	131.8	124.5	117.9	112.0
15	123.0	116.2	110.0	104.5
16	115.3	108.9	103.2	98.0
18	102.5	96.8	91.7	87.1
19	97.1	91.7	86.9	82.5
20	92.2	87.1	82.5	78.4
21	87.9	83.0	78.6	74.7
22	83.9	79.2	75.0	71.3

8. Depress

9. Depress . An "E" will appear.

RATE CAL 7

- 10. Enter the number from above.
- 11. Depress

If you frequently switch seed spacings, a different seed spacing may be entered for RATE 2. If the seed spacing is to always be the same, enter the same rate in RATE 1 and RATE 2.

ALL NECESSARY ENTRIES HAVE BEEN MADE. IF THE CAL IS DISPLAYED IN THE RATE DISPLAY AREA AND FLASHING-NOT ALL FUNCTIONS HAVE BEEN PROGRAMMED

To check the required programming, depress and hold the SELF-TEST key. The DATA display should show US, SP-2, LI, and C-P. If all of these entries are correct, continue below. If they are not, the console must be reprogrammed (see page 27).

Check the BOOM CAL, SPEED CAL, METER CAL, VALVE CAL, RATE CAL 1, RATE CAL2. All of these functions must have the correct number entered.

DATA MENU

The DATA MENU contains many functions. The operation of the potato planter uses the **LOW PWM OFFSET**, **HIGH PWM OFFSET**, **RO**, and **GAP**. GAP is used if a seed monitor system is installed. Any functions not listed below need to be turned "off" or given a "0" value. Incorrect values may affect operation of the console and give false alarms.

The LOW PWM OFFSET and HIGH PWM OFFSET numbers narrow the range that the valve works. The low pwm allows the valve to open to a certain point when the master switch is turned on. The valve should open enough to begin planter as soon as movement is sensed on the radar. A low PWM offset that is too low may cause planter delay on startup. If the planter pick wheels continue to run after the master switch is shut off, the LOW PWM OFFSET number is too high. The HIGH PWM OFFSET is the setting for the maximum speed that you want the pick wheels to run. This setting prevents the pick wheels from rotating too fast, which can break the shear bolts.

1.	Depress .
2.	Depress until Rate Alarm appears. Depress to toggle on or off (factory setting is "ON").
3.	Depress until Display Smoothing appears. Depress to toggle on or off (factory setting is "ON").
4.	Depress "ON"). until Rate Change Alarm appears. Depress to toggle on or off (factory setting is
5.	Depress until OFF Rate Percent appears. This value is the percent of the programmed rate that you allow before the Off rate alarm will sound. Factory setting is 30 (alarm will sound if sensors show rate is 30% off of programmed rate).
6.	Depress until High PWM Offset appears. This is the number used to control the upper limit of oil
	flow beyond the valve. The factory setting for this function is 160. To change the setting, depress . An "E", will appear. Enter 160. Depress
7.	Depress until Low PWM Offset appears. This is the number used to control the lower limit of oil flow beyond the valve. If the planter continues to run (creep) after the tractor stops, lower the setting by 2 points until creeping stops. The factory setting for this function is 36. If the planter hesitates when starting, raise the setting by 5 points at a time until the planter starts creeping, then lower the setting by 2 points at a time until
	creeping stops. To change the setting, depress An "E" will appear. Enter desired number.
8.	Depress until PWM Frequency appears. This number is determined by the brand & type of PWM valve. The default setting for this function is 122. DO NOT change this setting unless you are changing the
	brand or type of PWM valve. To change the setting, depress An "E" will appear. Enter 122.

DATA MENU - Continued

If the planter is equipped with seed sensors, the RO number should equal the number of planter rows. If seed sensors are not installed, enter 0.

9.	Depress until RO appears. Depress	An "E" will appear. Enter the number of planter rows.
	Depress .	

If planter is installed with seed sensors the GAP function must also be programmed. The higher the GAP number, the less sensitive the monitor is.



Depress . Consoles are preprogrammed with 75 as Preset Offset number. The Preset Offset helps reduce planter hesitation at startup. Increase this number in 5 point increments to as high as 95. Do not go higher than necessary. A number too high may start the planter so fast it will break the row unit shear bolts.

ALL PROGRAMMING NECESSARY FOR PLANTER OPERATION IS NOW COMPLETE

SELF-TEST

Self test allows speed simulation for testing the system while the planter is not moving.

SPEED

 \bigcap

UNPLUG RADAR FROM HARNESS WHILE IN SELF-TEST MODE. THE SELF-TEST SPEED WILL CLEAR IF RADAR DETECTS MOVEMENT.

1. Depress

2. Enter 3 (3 miles per hour). **DO NOT** go above 6 m.p.h. or the shear bolts for the clutch may break.

3. Verify the Speed by depressing

To run the planter:

1. Place the MASTER switch on the control box to "ON".

2. Place the PLANTER switch on the control box to "ON".

3. Move the INC lever until planter is running.

4. Move the INC/DEC lever to see rate changes.

5. Place the FEEDER CHAIN switch on control box to "On".

6. Move the DEC lever until planter stops.

7. Place PLANTER switch on the control box to "OFF".

8. Place FEEDER CHAIN switch on control box to "OFF".

9. Place MASTER switch on control box to "OFF".

10. Plug radar into harness. The self-test speed will clear when the radar detects motion.





4.9 ATTACHING TRACTOR

When hooking the Planter to a tractor, follow this procedure:

- 1. Clear the area of bystanders, especially small children.
- 2. Make sure there is enough room and clearance from obstacles to safely back up to the Planter.
- 3. Back up slowly and align the link arms as required for your machine.
- 4. Two point attachment with Quick Hitch.
 - a. Align the claws on the Quick Hitch slightly below the mounting pins on the Planter.
 - b. Back up until the pins on the Planter are above the claws.
 - c. Raise the 3-point hitch until the pins seat in the claws.
 - d. Be sure the retainers are released to hold the pins in the claws.

e. Adjust the turnbuckle on the top link to position the Quick Hitch vertically when the lower lift arms are horizontal.

- f. Set the 3-point hitch in the non-sway position
- g. Set the lower links on the tractor in the free float position.

IF YOUR TRACTOR IS NOT EQUIPPED WITH A QUICK HITCH, IT WILL BE NECESSARY TO INSTALL THE MOUNTING PINS THROUGH EACH BALL ON THE 3 POINT HITCH. BE SURE TO INSTALL THE RETAINER ON EACH PIN.

5. Connect the other hydraulic circuits.

6. Route the electrical switch box and control console into the cab. Route the electrical cord over the hitch and secure in position with clips, tape, or plastic ties. Be sure the wire doesn't dangle and contact the ground or become pinched. Allow enough slack for turning.

7. Start the tractor and raise the machine.

8. Remove pin from frame stands. Raise stand into storage position and re-pin.

9. Raise and lower machine a couple of times to be sure everything is secured, tight, and functioning.

10. Check rear lift wheels for function and operation.

4.10 DAILY INSPECTION

The Planter should be thoroughly inspected at the start of each working day to ensure that all parts and systems are in good condition and working properly. If this inspection is not done, minor problems could result in poor planting performance in the field.

These items should be checked at the start of each day:

Note: It is recommended that each planting wheel and drive wheel be rotated by hand to get an accurate check of the components

PLANTING COMPONENTS:

- a. Bent or broken picks on each arm.
- b. Pick arm springs.
- c. Free movement of each cam roller.
- d. Position and condition of each cam.
- e. Over running clutch and chain

HYDRAULIC SYSTEM:

- a. Routing and condition of all components.
- b. Tighten or repair all leaking components.
- C. Make sure all electrical connections are tight.

HYDRAULIC DRIVE:

- a. Radar gun is secured in position
- b. Drive motor and chain turn smooth.

GROUND ENGAGING COMPONENTS:

a. Wear on "Opening Frog" of planting shoe.

b. Damaged closing disc or worn bearings.

c. Damaged opening disc or worn bearings if equipped with Fertilizer attachment (not shown).

ELECTRICAL SYSTEM:

a. Damage to wiring harness components.

b. Damage to Connections at solenoids.

c. Function of seed bowl switches.

d. Condition of switch on electrical box and power connections.

It is very important to ensure good field performance that the operator corrects each problem found during the inspection before starting to work. Little problems won't become big problems, and the machine will perform as expected.

4.11 MACHINE SETTINGS

During the machine inspection that the operator should do at the start of each working day, it is his responsibility to check each machine setting to ensure that they are appropriately set for the operating conditions. The following adjustments should be checked:

4.11.1 Gauge Wheels



Each row is equipped with a set of gauge wheels to control planting depth. The two gauge wheels carry part of the weight of the planting shoe as the machine moves through the field. All irregular seedbed conditions are evened out by the wheels. A variety of holes provided to are adjust gauge wheels.



The height of the gauge wheels are set by the adjusting cranks on the front of the row unit frame. Turn clockwise to raise and counterclockwise to lower. Repeat with other gauge wheel assemblies. Always operate all gauge wheels at the same depth.

The gauge wheels are also adjustable on the gauge wheel itself. Adjust here as needed, to avoid having adjusting cranks to low.



4.11.2 Picker Wheel/Seed Bowl Clearance

Clearance is provided between the picker wheel and the seed bowl to:

a. Allow self-cleaning: dirt, sprouts, and seed piece slivers can fall out to prevent plugging.

b. Allow seed piece alignment for good pick centering and penetration. When the seed pieces fill the gap, the picks will be approximately centered in the piece.

c. Provide increasing clearance as the seed moves up the tapered gap. This minimizes drag on the seed piece that can cause the piece to fall off the picks.

d. Prevent contact between the seed bowl and picker wheel that would result in mechanical damage to either component.

See page 56 for instructions on setting clearance.



4.11.3 PICK PLACEMENT IN PICK ARMS



Each pick arm is equipped with 3 or 4 holes for pick mounting. The holes provide different pick placement for different seed sizes and shapes. Although any pick placement can be used if it works, the following table should be used as a guide when starting.

Seed Condition Average size seed. Normal Position. Factory placement	Number of Picks 2 2	Pick Placement 1 and 3 5 and 6
Small seed with few or no large pieces	2	1 and 2
Large average seed	2	1 & 4 or 3 & 4
Very Large Seed. Wet seed that has difficulty staying on picks	4	1, 2, and 3 or 1, 2, and 4 or 1,3, and 4





4.11.4 PICKER WHEEL CAM

Each picker wheel is equipped with a cam mounted on the machine frame that contacts the spring loaded pick plate release arm. The cam is located on the lower segment of the picker wheel arc.

As the picker wheel rotates, the pick plate release arm roller should contact the cam at the 3:30 position (viewed from the right side of the machine). This cam contact point will withdraw picks from the strike plate, retract the picks from the seed, and drop the seed behind the shoe for planting. The cam should not move the pick arm so far that a space is opened between the ends of the picks and the strike plate. A gap can allow other material to get in and prevent the arm from snapping closed when capturing the next seed. A large gap between the stripper plate and the pick can cause unnecessary wear and fatigue on the pick arm.

The cam must release the arm at the 6:30 position to allow the picks to stab the next potato as the pick components move through the seed bowl.

It is very important that the cam and roller are aligned to give a dynamic release and insertion action by the picks. Each pick assembly must have a spring to provide the force to close the pick arm and push the picks into the next seed.

PICKER WHEEL CAM ADJUSTMENT

As the picker wheel turns, the roller on the end of the pick arms contacts the stationary cam on the bottom of its arc. The cam should contact the rollers at the 3:30 position and release it at the 7:30 position (viewed from the right side of machine).

The cam should be aligned to make full contact with each pick arm roller as the picker wheel rotates.

When the roller contacts the cam, the pick arm pivots to withdraw the picks through the holes in the striker plate. No gap should be left between the striker plate and the ends of the picks.

To adjust the cam for alignment with the roller and pick arm movement, follow this procedure:

- 1. Loosen the cam mounting bolts on the front and bottom of the cam.
- 2. Adjust cam to the required position.
- 3. Rotate the picker wheel to check roller alignment and pick arm movement on each pick assembly.
- 4. Tighten the mounting bolts to their specified torque levels.



4.11.5 Feedbox Chain Speed

Factory setting is between 2 and 3. Keep feed chain as slow as possible to maintain accurate picking. As Long as planter is not producing large number of skips, seed volume is adequate. Too much seed is almost always more of a problem as opposed to too little seed.



Flow Control (Feedbox Chain)

4.11.6 PLANTER SHOE DEPTH REAR

The planter shoe is suspended at the rear by a set of chains attached to the arms of the closing discs. Each chain should have a slight amount of slack when the shoe is in its planting position.

This will allow the shoe to float as required when planting and lift the row unit for turning and transporting. Adjust the length of the chain at its frame attaching point by fastening to another link. Always keep the lengths the same on each row unit.

4.11.7 CLOSING DISC ADJUSTMENTS

Each closing disc can be adjusted in a vertical direction and spaced from the center of the row. Use these features when adjusting:



A. VERTICAL

1. 3 holes are located in the disc shank for tilt adjustment.

2. A setscrew is located through the mounting frame of the shank that is used to raise or lower the shank/disc assembly. Tighten the setscrew to its specified torque after adjusting.

3. The disc clamp is slotted for changing disc angle. This angle determines the size of the hill. All clamps should be set at the same angle.

B. ROW SPACING

The disc frame assembly is attached to the row unit frame crossmember. Loosen the mounting clamps and slide the assembly to its required position. Tighten mounting clamps.

Important

Maintain Closing Discs on all row units at the same setting to obtain consistent planting results

C. POSITION

The closing discs are held in position when planting with a tension spring between the disc assembly and the row unit frame.

The tension is set with the eyebolt on the top and should be set so the spring is snug when the row unit is out of the ground.

4.11.8 SEED BOWL VOLUME

Each seed bowl is equipped with a pivoting arm that is depressed as seed covers the arm. As the seed level drops, the seed moves to the side of the bowl and uncovers the pivoting arm. The arm will then move up.

A switch is located under the pivoting arm to control the volume of seed in the seed bowl. To adjust, follow this procedure:

1. Loosen the 2 bolts mounting the switch and pivot arm assembly - to the frame.

2. Move the switch arm assembly down to decrease the level of cuttings in the seed bowl.

3. Move the switch arm assembly up to increase the level of cuttings in the seed bowl.

4. Tighten the mounting bolts to their specified torque level when adjustment is completed.

- 5. Check all electrical connections before starting to work.
- 6. Repeat adjustment on other switches as required.



Note:

Although moving the switch assembly will change the level in the seed bowl, changing the feed rate can also affect the level.



Each planter row is equipped with a seed bowl to supply seed to each set of picker wheels. Each pick assembly captures a seed as the pick arm moves past the side of the seed bowl.

A switch is located under the seed sensing plate in the bottom of the bowl to control the running of the seed feeding chain. As the bowl fills with seed, it covers the top of the sensing plate and depresses it. The plate contacts the switch and closes it.

The switch is wired to the solenoid for the feeding chain drive. When the switch closes, the solenoid is opened to divert the oil in the hydraulic circuit away from the hydraulic motor driving the feed chain. As the seed is used and the level drops, the sensing plate is released, opening the switch. When the switch opens, the solenoid closes to run the hydraulic motor driving the feeding chain. The seed bowl is filled.

If the seed level in the bowl is too low, seed will not be in place to be captured when the pick arm snaps shut. If the level is too high, seed can be dragged around by the picker wheel and too much seed is dropped.

The following items must work together:

a. Sensing plate must pivot freely and move from the weight of the seed in the bowl.

b. The switch must open and close per the releasing and contacting of the sensing plate. The switch can be moved on its mounts to change the fill level in the bowl.

c. The hydraulic motor runs at a speed determined by volume of oil flowing through the circuit. Normally, a 3 g.p.m (11 Lpm) flow rate provides the optimum feed rate. Use the flow control on the planter to set the flow rate

A high flow rate will increase the speed of the feeding chain and require excess cycling of the system. A low flow rate will require more running by the feeding chain. If it is too low, there will not be enough seed supplied for consistent planting.

4.11.9 Field Operation

When operating the machine in the field, follow this procedure:

- 1 Clear the area of bystanders, especially small children, before starting.
- 2 Check that components, systems, and the machine are set appropriately for the operating conditions.
- 3 Transport the machine to the field. See Safety Section on Page 4
- 4 After arriving at the field, fill the hopper with seed. Seed cutters must be adjusted to properly cut a given seed size.

NOTE IT IS NOT RECOMMENDED THAT THE MACHINE BE TRANSPORTED WHEN THE HOPPER IS FILLED. THE EXTRA LOAD ON THE MACHINE CAN CAUSE ADVERSE HANDLING CHARACTERISTICS AND LEAD TO STRUCTURAL FAILURES AT FASTER SPEEDS.

- 5 Fill the pesticide hoppers if your machine is equipped with that option.
- 6 Move the vehicles or equipment away from the working area.
- 7 Align the machine with the edge of the field if just starting or with the previously planted row.
- 8 Lower the machine to the ground.
- 9 Lower tractor 3-point hitch until crossmembers are 2 -3" higher in the front.
- 10 Drive approximately 30 feet in typical ground conditions and check planting depth. Adjust gauge wheel to desired depth (see page 37).



MACHINE SETTINGS – Continued

11 After seed depth is obtained, observe angle of shoe linkages. Linkage should be approximately 2" to 3" lower in the rear when planting. This will allow the gauge wheels to carry only the weight of the row unit and float over obstructions if any are encountered. The trailing action of the parallel linkage results in a more consistent planting depth.



- 12 Raise or lower 3-point hitch and rear cylinders to obtain proper angle on shoe linkage while maintaining planter frame angle. Adjust rear cylinder and 3-point lever stop accordingly.
- 13 Lower the marker if your machine is so equipped. The sequencing valve supplied with the optional marker controls its operation.

To operate the markers, connect the hose to give the following sequences:

- a. Move the hydraulic lever to the "raise" position to raise both markers.
- b. Move the lever to the "lower" position to lower one marker.
- c. Move the lever to the "raise" position to raise the marker.
- d. Move the lever to the "lower" position to lower the other marker.
- e. To lower both markers, move the hydraulic lever to the "lower" position / momentarily to the "raise" position, and then back to the "lower" position. Both markers will be lowered.
- f. Move the hydraulic lever to the "raise" position to raise both markers. The valve will then return to its normal sequencing cycle.
- g. Raise or lower markers as required for operation and transporting.
- 14 Engage hydraulic lever for planter hydraulic system.
- 15 Put Power switch on Raven console to "ON"
 - To preload pick arms and bowl:
 - a. Put the rate switch to "MAN".
 - b. Put the planter switch to "ON".
 - c. Put the feeder chain switch to "ON".
 - d. Put the Master switch to "ON".
 - e. Use the Increase/Decrease switch until the pick wheels turn (seed feedboxes should be filling bowl). When all arms are loaded with potatoes, move switch from MAN to AUTO.



POWER

RATE

FLOW CONTROL

RATE

INC

16 Planter pick wheels will turn when radar gun senses movement.

MACHINE SETTINGS – Continued

- 17 Recommended planting speed is 3.5 to 5 mph to obtain the most consistent planter performance.
- 18 Slow down at the end of the round and put the Master switch to "OFF" before turning. Raise the machine and the marker as the shoes cross into the headland area.
- 19 Swing wide to minimize excess frame loads while turning. When using duals on tractor with front stabilizer wheels, be sure duals do not contact stabilizer wheel when making turns.
- 20 Lower machine to pre-set depth and lower the markers.
- 21 Before quitting, empty out seed bowls. Move feeder chain switch to "OFF" before coming to the end.

4.12 Operating Hints

If the tractor has not moved for 60 seconds, the monitor will shut off.

Start the flow control valve at the #3 setting.

Start the hydraulic speed control (rabbit and turtle) on the tractor at just under half speed. if there is not enough oil, the monitor will flash "APER".

Always connect the power source directly to the battery.

The frame should be 2 to 3 inches higher in the front and set high enough so the parallel linkage is lower in back by 2 to 3 inches.

Keep the potato level in the bowl as low as possible.

Clear the potatoes away from the switch at the end of the day.

If seed pieces are planted too shallow, reduce speed and/or check gauge wheel depth.

18 RPM on the picker wheels has been shown to have the best consistency.

Do not use the hydraulic system to operate other equipment.

If all feeds do not run, this does not indicate an electrical problem.

SEED SIZE AND VARIETY

Wide variations in the size and shape of your seed will result in poor planter performance. Although the machine can handle cut or whole seed, it has difficulty handling both at the same time because the operational settings change.

Time spent to ensure consistent seed size and type pays rich dividends in planter accuracy, consistency and faster planting.

TIRE SPACING

Normally the tire spacing on the rear of the machine is set at twice the row spacing. For example: 36" rows require 72" tire spacing. However, when your machine is equipped with mono rib tires, it is recommended that the tire spacing be set to match the tire spacing of the tractor to be used during the first cultivating pass. If the spacing is not the same, the tractor will be difficult to control and keep in the center of the rows.

THE RAVEN MONITOR HAS AN AUTOMATIC SAFETY FEATURE THAT WILL SHUT DOWN IF SPEED IS BELOW .8 MPH FOR MORE THAN 10 SECONDS

CYCLE MASTER SWITCH TO BEGIN OPERATION



4.13 Transporting

TRANSPORT SAFETY

- 1. Make sure you are in compliance with all local regulations regarding transporting equipment on public roads and highways.
- 12. Make sure the SMV (Slow Moving Vehicle) emblem and all the lights and reflectors that are required by the local highway and transport authorities are in place, are clean, and can be seen clearly by all overtaking and oncoming traffic.
- 13. Do not allow anyone to ride on the Planter or tractor during transport.
- 14. Do not exceed 32 km/h (20 mph). Reduce speed on rough roads and surfaces.
- 15. Do not transport with tank(s) loaded.

When transporting the machine, review and follow these instructions

- 1. Be sure all bystanders are clear of the machine.
- 2. Ensure that the machine is securely attached to the tractor and all retainer pins are installed.
- 3. Raise the machine and install the transport lock before transporting.
- 4. Clean the SMV emblem and all lights and reflectors before starting.
- 5. Be sure that all lights required by the local highway authorities are in place, clean and functioning so they can be seen by oncoming and overtaking traffic.
- 6. If transporting during times of limited visibility or dusk, install extra lights or use pilot vehicles.
- 7. Always use hazard flashers on the tractor when transporting unless prohibited by law.

- 8. Watch through the expanded metal grill on the hopper for overtaking traffic. Keep to the right and yield the right of way to allow faster traffic to pass. Drive on the road shoulder, if permitted by law.
- 9. Do not allow riders on the machine.
- 10. Do not transport when the machine is loaded.
- 11. Never exceed a safe travel speed.
- 12. Always shift to a lower gear when going down hills to use the engine as a retarding force.
- 13. Apply the brakes carefully to prevent jackknifing.
- 14. Never disengage tractor drive train and coast down hills. Always keep tractor in gear.
- 15. Never tow the machine faster than 20 mph (32 km/h). The ratio of the tractor weight to the planter weight plays an important role in defining acceptable travel speed.

4.14 STORAGE

4.14.1 PLACING IN STORAGE

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

1. Thoroughly wash the machine using a pressure washer to remove all dirt, mud, debris, or residue. During the final rinse, add a good disinfectant to the pressure washer tank to disinfect the machine.

NOTE DO NOT point high pressure directly on wire connections or encoders If planter is equipped with fertilizer attachment, wash with a solution of 10% Vinegar / 90% Water

- 2. If a disinfectant is not used, fungus and mildew will grow during the storage period and could contaminate next year's crop.
- 3. Inspect the following components:

Soil Engaging Components:

a. Check for worn or damaged planting shoes. Look for signs of wear on "opening frog" of shoe. If wear is detected, rebuild or replace planting shoe.

b. Check closing discs for damaged or worn bearings. Replace disc or bearings as required.

c. Check opening discs for damage or worn bearings (for machines with optional fertilizer attachment). Replace disc or bearings as required.

Planting Components:

- a. Check all pick arms for bent or broken picks. Straighten or replace as required.
- b. Check pick arms for damaged or broken springs. Replace as required.

c. Lubricate pick arm pivot. Use WD-40, LPS -2. or equivalent to spray pivot bushing area. Work pivot arm several times to get lubricant into the bushing and then spray again.

d. Rotate all picker wheels and lubricate each pick arm bushing.

- e. Check Cam Bearing for damage.
- f. Check all pick arm cams for damage, wear, or misalignment. Repair as required.

g. Lubricate over-running clutch at the front of each row unit.

h. Inspect and lubricate the roller chain on row unit drive. Replace damaged or worn roller chain as required.

i. Repack gauge wheels on each row unit. Replace bearings with damaged seals.

j. Lubricate all grease points. (see Maintenance Section).

Electrical system:

a. Check the wiring harness and all wiring for damaged or worn areas. Check for cracked or worn insulation. Replace any components that have come in contact with moving parts and route to prevent damage in the future.

b. Check all seed bowl switches for proper operation. Repair or replace any damaged or malfunctioning switches or wiring harness.

- c. Check all hydraulic solenoids for loose or damaged wires. Repair or replace as required.
- 4. Make a list of all parts needed for repairs and order them immediately. Repairs can then be done when time permits to prevent unnecessary down time at the start of next season.
- 5. Lubricate all grease points to remove any water residue from the washing and prevent rusting during the storage period. Rotate all moving parts to distribute lubricant to all surfaces.
- 6. Coat each roller chain with a good quality chain lubricant to prevent rusting. Rotate the chain slowly by hand to cover all surfaces.
- 7. Apply a light coat of grease on the shafts where the sprockets slide on the transmission driving shaft and on the picker wheel over running clutch shaft.
- 8. Remove material that has become entangled in any drives.
- 9. Touch up all paint nicks and scratches to prevent rusting.
- 10. Move the machine to its storage area.
- 11. Select an area that is dry, level, and free of debris.
- 12. Place planks or blocks under the hitch pole on the pull-type model.
- 13. Unhook the machine from the tractor (see page 35).
- 14. Place all wiring harness and hydraulic line components in a safe place on the hitch to prevent damage and keep clean during the storage period.
- 15. If the machine cannot be stored inside, cover with a waterproof tarpaulin and tie securely in place.
- 16. Store out of the way of human activity.
- 17. Do not allow children to play around stored unit.

4.14.2 REMOVING FROM STORAGE

When removing from storage and preparing to use, follow this procedure:

- 1. Clear the area of bystanders, especially small children.
- 2. Remove the tarpaulin from the machine if it was covered.
- 3. Attach the tractor to the machine (See Page 35).
- 4. Check:
 - a. Tire pressure. Add as required.
 - b. Re-torque all wheel bolts.
 - c. Re-torque all hardware.
 - d. Routing and securing of all hydraulic lines and wiring harness. Adjust as required.
- 5. Rotate all components and systems by hand to see that none are seized. Loosen any seized components with penetrating oil before starting.
- 6. Lubricate all grease points, roller chains, and shaft surfaces with sliding sprockets.
- 7. Review and follow all items on the Pre-Operation Checklist and Daily Inspection before starting.



- 12. Follow all the operating, maintenance, and safety information in the manual.
- 13. Support the machine with blocks or safety stands when changing tires or working beneath it.
- 14. Stop tractor engine, lower machine to the ground, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging, or filling.
- 15. Make sure all guards are in place and properly secured when maintenance work is completed.
- 16. Never wear ill-fitting, baggy, or frayed clothing when working around or on any of the drive system components.
- 17. Before applying pressure to a hydraulic system, make sure all lines, fittings, and couplers are tight and in good condition.
- Install safety rod and pin securely in position on hitch cylinder frame before working under frame. Make sure safety rod is unhooked before resuming operation.
- 19. Relieve pressure from hydraulic circuit before servicing or disconnecting from tractor.
- 20. Keep hands, feet, hair, and clothing away from moving or rotating parts.
- 21. Clear the area of bystanders, especially small children, when carrying out any maintenance and repairs or making any adjustments.
- 22. Wear appropriate protective gear when contacting chemical handling components on machine.

5.1 SERVICE

5.1.1 FLUIDS AND LUBRICANTS

- 23. Grease Use an SAE multi-purpose high temperature grease for all applications Also acceptable is an SAE multi-purpose lithium base grease.
- 24. Roller Chain Lubricant Use WD-40, LPS-2, or equivalent to coat roller chains and bushings to prevent rusting or seizing.
- 25. Storing Lubricants

Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contaminants.

26. When pressure washing, do not directly spray the side (seal) of the bearing. This will damage the seal and reduce the life of the bearing.

5.1.2 GREASING

Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use only a hand-held grease gun for all greasing. Air powered greasing systems can damage the seals on bearings and lead to early bearing failure.

IMPORTANT

Over-greasing can damage bearing seals. A damaged seal will lead to early bearing failure. Replace all bearings with damaged seals immediately.

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

SEALED BEARINGS

Sealed bearings are used at several locations on this machine. All sealed bearings are lubricated at the factory and the seals retain the grease inside the bearing and prevent dirt and other contaminants from getting inside. The life of the sealed is virtually limitless provided it is not damaged in any way. When sealed bearings are greased, the grease is introduced next to the outer face of the seal. When a hand held grease gun is used, the grease slips in next to the seal without damaging it. An air powered greasing system will inject the grease so fast that it is no uncommon for them to damage a seal. Once the seal is damaged, the factory installed grease comes out and the bearing runs dry. Seizing will then occur in a short time.

Should you notice that a seal is damaged, replace the bearing immediately to prevent problems at a later time.

SEALED BEARINGS

Occasional greasing of sealed bearings is required to remove moisture and contaminants from the space next to the seals. It is not recommended that sealed bearings on the machine be greased any oftener than once every season after the machine is washed and then only give them one shot. More frequent lubrication runs the risk of damaging the seals and causing bearing failure. The exception to this rule is at the beginning and end of the season. At those times, each bearing should be given only one shot of grease to remove moisture or water next to the seal that can accumulate during washing or storage.

ROLLER CHAINS

Check all chains daily for tension. Lubricate chains every 20 hours of operation. Tighten chains so there is approximately 1/4 to 1/2" of slack on the side of the chain opposite the tightener or so that you can slide the chain back and forth with your fingers on one of the sprockets. DO NOT over tighten. Replace all shields after servicing chains.

Action Code	L = Lubricate CL = Clean	R = D =	Repack Disinfect						
	Hours								
Maintenance	Serviced By								
L Gauge Wheels									
L Walking Beam									
L Over-Running Cl	utch								
L Rear Wheel Pivots									
									1
Annu	ally								
L Roller Chains									
L Picker Wheel Dri	ve Chain								
L Feeding System	Drive Chain								
L Hydraulic Drive F	Roller Chain								
R Rear Wheel Bea	rings								
R Gauge Wheel Be	earings								
R Picker Wheel Hu	ibs								
CL & D Machine									



SERVICE INTERVALS



Repack Wheel Bearings Annually



Grease Daily 2 Locations per row



Grease Daily 2 Locations per Walking Beam

SERVICE INTERVALS



5.2 MAINTENANCE

5.2.1 PICKER WHEEL DRIVE SPROCKET

Each picker wheel is driven by a sprocket that mates with a roller chain on the circumference of the wheel. To check and adjust the clearance, follow this procedure:

a. Checking clearance

Hold the picker wheel in a stationary position and turn the drive sprocket by hand. The teeth on the sprocket should move approximately 1/16 inch (1.5 mm) to have proper clearance.

Less clearance or movement can introduce vibration into the picker wheel and cause the potatoes to fall off the picks. More clearance or movement can cause uneven plant spacing.

b. Adjusting clearance

Loosen the bearing mount bolts on the sprocket shaft. Move bearing and shaft to the required position. Tighten the bearing bolts to their specified torque.



5.2.2 PICKER WHEEL TO SEED BOWL CLEARANCE

The machine is designed to have a tapered clearance between the seed bowl and the picker wheel. This clearance provides a self-cleaning action, eliminates contact damage, and reduces drag on the seed piece. To set or adjust this clearance, follow this procedure:

1. Clear the area of bystanders, especially small children.

2. Raise the machine and place safety stands under the front frame.

3. Loosen the four bolts attaching the seed bowl to the row unit frame.

4. Move the bowl to the desired position.

5. The clearance at the bottom should be 1/8 to 3/16 inches (3 to 4.5 mm).

6. The clearance at the top front of the seed bowl should be 3/8 inch (9 mm).

7. Measure the clearance dimensions carefully before tightening mounting bolts.

8. Tighten mounting bolts to their specified torque levels.

9. Remove safety stands.

5.2.3 RETIMING PICKER WHEELS

The picker wheels are designed to drop seed pieces into the planting shoe in an alternating sequence. To maintain proper seed spacing, the dimensions between the picking arms on the facing picking wheel must be equal. Should wear, mechanical damage or repairs change this dimension, retime the picker wheels by following this procedure:

- 1. Clear the area of bystanders, especially small children.
- 2. Raise the machine and place safety stands under the front frame.

3. Measure the distance between the pick arms so that they are centered between the two arms on the opposite wheel.

4. If not equal:

a. Loosen the bearing mounting bolts on one of the picker wheel shafts.

b. Slide the picker wheel back until the driving sprocket clears the wheel.

- c. Rotate the picker wheel slightly.
- d. Measure the dimension between the picking arms.
- e. If the dimensions are equal, move the picker wheel back into position and secure in place.
- f. If the dimensions are not equal, rotate the picker wheel until they are equal.
- g. Tighten picker wheel shaft mounting bolts to their specified torque levels.

5. Remove safety stands







Always support frame with safety stands before working under machine.



5.2.4 ROW UNIT SHEAR BOLTS

The drive of each row unit is protected by shear bolts on the driving sprocket should the picker wheel jam. To replace shear bolts, follow this procedure:

1. Clear the area of bystanders, especially small children.

2. Place all controls in neutral, stop engine, set the park brake, and remove ignition key.

3. Carefully remove remaining shear bolt using a hammer and punch if necessary. Do not enlarge holes.

4. Install new shear bolts (2 required and tighten).

5.2.5 HYDRAULICS

Daily:

- 1. Check indicator on hydraulic filter. Replace element when indicator is in red zone.
- 2. Check hydraulic hoses for pinching, fraying, etc. Replace any damaged hoses.
- 3. Check for leaking fittings, couplers, or cylinders. Replace, repair as needed.
- 4. Check hydraulic control valve for any visible damage. Repair as necessary.



5.2.6 ROLLER CHAIN TENSION

The machine has several roller chains that are used to transmit power. To adjust the tension of these chains, follow this procedure:

5.2.7 HYDRAULIC DRIVE CHAIN

1. The hydraulic drive chain tension is set by the idler sprocket.

2. Loosen the nut on the sprocket and slide or tap to the required – position. Tighten until the long span is snug.

3. Tighten the nut on the idler sprocket.





5.2.8 PICKER WHEEL DRIVE CHAIN

- 1. The picker wheels on a row unit are driven by a single chain.
- 2. The chain tension is set with a spring loaded idler.
- 3. Normal spring tension will give 1/8 inch (3mm) spacing between the coils.
- 4. This will keep the chain on the long span snug.
- 5. Check the springs on other row units as required.

5.2.9 FEEDBOX ROLLER CHAIN DRIVE

1. Each feed chain is driven by a hydraulic motor through a roller chain.

- 2. Loosen the nut securing the idler sprocket.
- 3. Slide or tap the idler into its required position.
- 4. The chain on the long span should be snug. Do not ertighten.
- 5. Tighten the idler bolt to its specified torque.
- 6. Repeat on the other row units as required.





Machine is shown with guards removed for illustrative purposes only. Do not operate with guards removed

5.2.10 FEED CHAIN TENSION

The feed chain moves cuttings from the hopper into the seed bowls for planting. To adjust the tension, follow this procedure:

- 1. Loosen the chain idler bolts on both sides of the feed chain. .
- 2. Adjust until there is approximately 1 inch (25 mm) of sag on the loose (bottom) side of the chain.
- 3. Tighten the chain idler bolts to their specified torque.
- 4. Adjust tension on the other feed chains as required.

5.2.11 Operation of Feedbox Motor Control Solenoid

On Harriston planters, the feedbox providing seed to the planter bowl is controlled by an electric solenoid mounted on a hydraulic motor. Oil for the hydraulic motor flows from the return side of the planter pick wheel drive motor. Oil flow is regulated by a manual flow control. An electric switch in the feed bowl provides 12 V.D.C. to the solenoid for control of oil flow for each individual feedbox. When the seed bowl is being filled, the electric switch is closed, which sends current to the solenoid. The solenoid closes the by-pass line in the motor manifold, which directs oil to the hydraulic motor.



In Figure 1, electric current is off, the by-pass is open, which diverts hydraulic oil away from motor; therefore the motor does not run.

In Figure 2, Electric current activates magnetic solenoid. The solenoid closes the by-pass and directs oil flow to the hydraulic motor (motor runs).

All feedbox motors are connected in a hydraulic series, which means hydraulic oil flows from one motor to the next. Oil flow is the same regardless of how many motors are in the circuit. As the number of motors (rows) increase, oil pressure increases proportionally. Example: one motor requires 150 P.S.I., 4 motors require 600 P.S.I. Motors that are operating require pressure. Motors that are not operating (because solenoid has opened by-pass) will not increase pressure. Pressure will continuously vary, depending upon how many motors are operating at any given time. Because all motors are connected in a series, if one stalls because of a jammed feed chain, all motors will stall because oil flow will be blocked.

5.2.12 Feedbox Motor Testing

If a piece of seed or foreign material jams one feedbox motor, oil flow will be stopped, therefore all motors will stop. To determine which motor is jammed, follow this procedure:

- 1. Turn feed chain switch OFF on switchbox in cab.
- 2. Disconnect power wires (white) from all feedbox solenoids. Leave ground wire connected.
- 3. Turn feedbox chain switch ON.
- 4. Starting at one end of the planter, disconnect one bowl switch wire (blue) and connect it to feedbox solenoid. If feedbox runs, it is NOT the jammed motor. Disconnect the power wire and move on to the next feedbox solenoid.
- 5. Repeat step 4 until you encounter a motor that DOES NOT run when you connect the power wire. This is the jammed motor. Oil will not flow through a jammed motor. Refer to the diagrams below to visualize how the oil flow is directed by the solenoids.



- 6. Place all controls in NEUTRAL, stop engine, place tractor in PARK, remove key.
- 7. Remove the object that is causing the problem.
- 8. Repeat step 4 to check feedbox that was jammed. If it functions now, reconnect all other feedbox solenoids and continue planting.



In Figures 1-4 above, Figure 2 is jammed. Power is connected to solenoid on Figure 3, which makes motor run. Oil can flow past jammed motor in Figure 2. Every motor that is not jammed will run when power is present at solenoid.



In Figures 5-8, Figure 6 is jammed. Power is connected to solenoid on Figure 6. Plunger is pushed down, attempting to force oil through the motor. Motor does not run. Because the motor is jammed, oil cannot flow through it.

Pictured below is the wiring diagram for bowl switch. Always replace diode when replacing bowl switch. **DIODE MUST BE INSTALLED AS SHOWN. PAY ATTENTION TO LOCATION OF GREY STRIPE.**



5.2.14 Rebuilding Shoes

If you wish to build up worn planter shoes, the following figures show the approximate dimensions of new shoes.



5.2.15 Walking Beam Tracking/Adjustment

The walking beams must be adjusted to make the planter track properly (pull straight) behind the tractor. The walking beams must be parallel to the tool bar under the tank. Follow this procedure to adjust walking beams:

- a. Seed / fertilizer tanks should be empty prior to adjusting walking beams (A).
- b. Position planter on smooth firm surface.
- c. The goal is for the measurement at (B) to be equal at both ends of each walking beam.
- d. Loosen (DO NOT REMOVE) 4 bolts (C) on walking beam frame.
- e. Using a method of tightening one adjusting bolt (D) and loosening the other one, adjust until measurement is the same at both ends of walking beam.
- f. Use a square as shown (E) or a tape measure if a square is not available. After adjusting, tighten bolts to recommended torque, move planter forward 50 100' and recheck measurements.





5.2.16 Servicing Pulse Width Modulating (PWM) Valve

In rare cases, contamination may enter the PWM Valve and cause the valve piston spool to stick, which will result in the valve malfunctioning. If that happens, it is necessary to disassemble the valve and clean the PWM Valve. Tolerances on the valve are very close. Any contamination, no matter how small, may cause the valve to malfunction. Follow these steps closely to disassemble/clean the valve. **DO NOT ATTEMPT IN FIELD**

- 1. Clean area near valve. Wipe/use compressed air.
- 2. Remove valve from planter. Plug all hose connections or wrap tape over connections to prevent contamination.
- 3. Find a clean area to disassemble. Place the valve in a vise or clamp with the solenoid (A) in a horizontal position.
- 4. Lay out a clean cloth to place parts on.
- 5. Remove plastic nut (B), O-Ring (C), and electric solenoid from solenoid valve stem. **ATTENTION: DO NOT** remove capnut (D) from solenoid valve stem or adjusting screw lock nut (E) from opposite end of valve. These are used to adjust balance between compression spring and solenoid valve. Any change in this adjustment could make the valve inoperable.
- 6. Using a 3/4" wrench, loosen solenoid valve stem (F). Unscrew and remove Note actuator pin (G) in solenoid valve stem.
- 7. Place solenoid valve stem on clean cloth.
- 8. Using a 7/8" wrench, loosen compression spring nut (H) on opposite end of valve body. **SLOWLY** remove nut, O-Ring (I), and compression spring (J). Lay these parts on clean cloth.
- 9. Using a clean/burr-free punch, **SLOWLY** push piston spool (K) out of valve body noting which direction spool is inserted (tapered end toward actuator pin). Place piston spool on clean cloth.
- 10. Using compressed air, blow through valve body cavity. Clean all disassembled parts with compressed air. It is not recommended the parts be cleaned with solvent. This could make the parts dry & difficult to reassemble. Check all parts for contamination & damage. Check valve body and piston spool for scoring. If any scoring is noted on piston spool or in valve body, valve must be replaced. **DO NOT** Attempt to interchange parts between valves.
- 11. Valve reassembly. Using clean hydraulic oil, lubricate valve body cavity and piston spool. Note orientation of tapered end of spool. **SLOWLY** slide spool into valve body. **IMPORTANT:** Because of extremely close tolerance, exposure to heat or even handling may expand piston spool enough to make it difficult to slide back into valve body. <u>Under no circumstances should the piston spool be forced into the valve body</u>. Forcing the piston spool into the valve body will likely result in irreparable damage. Blow compressed air on piston spool to cool it or if possible place spool in a cool place such as a refrigerator for a few minutes. After cooling, re-lubricate spool with clean hydraulic oil, check for proper orientation and slide into valve body.
- 12. Lubricate compression spring, place spring in nut and screw nut into valve body
- 13. **CAREFULLY** screw solenoid valve stem (with actuator pin) into valve body. Solenoid goes in the same side of valve body with the CF port. Tighten compression spring nut and solenoid valve stem. Re-install electric solenoid, Oring, and plastic nut. **Note**: On earlier valves, the valve actuator pin is separate from the solenoid valve stem. Extreme care must be taken on these early valves to make sure the actuator pin is fully inserted into solenoid valve body. Failure to do so could jam actuator pin piston spool, making valve inoperable.
- 14. Re-install valve on planter, making sure no contamination enters system. If this procedure does not correct valve malfunction, valve must be replaced.



seed spacing												
speed	6	7	8	9	10	11	12	13	14	15	16	17
1.00	7.3	6.3	5.5	4.9	4.4	4.0	3.7	3.4	3.1	2.9	2.8	2.6
1.50	11.0	9.4	8.3	7.3	6.6	6.0	5.5	5.1	4.7	4.4	4.1	3.9
2.00	14.7	12.6	11.0	9.8	8.8	8.0	7.3	6.8	6.3	5.9	5.5	5.2
2.50	18.3	15.7	13.8	12.2	11.0	10.0	9.2	8.5	7.9	7.3	6.9	6.5
2.75	20.2	17.3	15.1	13.4	12.1	11.0	10.1	9.3	8.6	8.1	7.6	7.1
2.81	20.6	17.7	15.5	13.7	12.4	11.2	10.3	9.5	8.8	8.2	7.7	7.3
3.00	22.0	18.9	16.5	14.7	13.2	12.0	11.0	10.2	9.4	8.8	8.3	7.8
3.25	23.8	20.4	17.9	15.9	14.3	13.0	11.9	11.0	10.2	9.5	8.9	8.4
3.50	25.7	22.0	19.3	17.1	15.4	14.0	12.8	11.8	11.0	10.3	9.6	9.1
3.75	27.5	23.6	20.6	18.3	16.5	15.0	13.8	12.7	11.8	11.0	10.3	9.7
4.00	29.3	25.1	22.0	19.6	17.6	16.0	14.7	13.5	12.6	11.7	11.0	10.4
4.10	30.1	25.8	22.6	20.0	18.0	16.4	15.0	13.9	12.9	12.0	11.3	10.6
4.25	31.2	26.7	23.4	20.8	18.7	17.0	15.6	14.4	13.4	12.5	11.7	11.0
4.50	33.0	28.3	24.8	22.0	19.8	18.0	16.5	15.2	14.1	13.2	12.4	11.6
4.75	34.8	29.9	26.1	23.2	20.9	19.0	17.4	16.1	14.9	13.9	13.1	12.3
5.00	36.7	31.4	27.5	24.4	22.0	20.0	18.3	16.9	15.7	14.7	13.8	12.9
5.25	38.5	33.0	28.9	25.7	23.1	21.0	19.3	17.8	16.5	15.4	14.4	13.6
5.50	40.3	34.6	30.3	26.9	24.2	22.0	20.2	18.6	17.3	16.1	15.1	14.2
5.75	42.2	36.1	31.6	28.1	25.3	23.0	21.1	19.5	18.1	16.9	15.8	14.9
6.00	44.0	37.7	33.0	29.3	26.4	24.0	22.0	20.3	18.9	17.6	16.5	15.5
6.25	45.8	39.3	34.4	30.6	27.5	25.0	22.9	21.2	19.6	18.3	17.2	16.2
6.50	47.7	40.9	35.8	31.8	28.6	26.0	23.8	22.0	20.4	19.1	17.9	16.8
6.75	49.5	42.4	37.1	33.0	29.7	27.0	24.8	22.8	21.2	19.8	18.6	17.5
7.00	51.3	44.0	38.5	34.2	30.8	28.0	25.7	23.7	22.0	20.5	19.3	18.1
7.50	55.0	47.1	41.3	36.7	33.0	30.0	27.5	25.4	23.6	22.0	20.6	19.4
8.00	58.7	50.3	44.0	39.1	35.2	32.0	29.3	27.1	25.1	23.5	22.0	20.7

PICK WHEEL SPEED BASED ON GROUND SPEED & SEED SPACING 18 RPMS (TARGET RPM) seed spacing

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6 OPTIONAL EQUIPMENT

Optional equipment is available from your dealer or the factory. It can be part of the machine at the time of purchase or installed in the field. Optional equipment includes:

6.1 Row markers

Row markers are used by the operator to define the required spacing when making the next pass.

1. They are mounted on the outside frame behind the frame stand.

2. Be sure the mounting bolts are tightened to their specified torque.

3. Route the hydraulic hoses along the frame and secure with clips or plastic ties to prevent damage.

4. Connect the hoses to the sequencing valve that comes with the package. It allows the markers to operate with only one hydraulic circuit.

Ø



6.2 Hill Rollers are mounted behind closing discs to help form and compact the rows. The roller floats behind the discs and is suspended on an adjustable chain.

The use of hill rollers improves germination in loose dry soil conditions.



6.3 Deer Tong Ripper Shank This ripper shank is used to break up the tractor tire track. It mounts on the front of the planter frame directly behind the tractor tire.





6.4 **Trash Shank**

In soil with heavy trash conditions, a toolbar mounted 1" flex coil shank can be used in front of each row unit. They are attached with an adjustable bracket.

6.5 **Rear Ripper**

This S-Tine is used to break up the tire track or break up the ground between all the rows.



6.6 Pesticide Applicator

The package consists of a 90 lb (40 kg) box for one or two rows (must be specified at the time of purchase), mounting frame, and drive system. Mounting may differ depending on planter options installed; platforms, dry fertilizer, etc.

1. Install the mounting frame to the planter frame so the boxes are positioned above the parallel linkage arms.

2. Tighten mounting bolts to their specified torque.

3. Install the drive system on the left side of the machine. A sprocket is installed on the shaft and a roller chain transmits the power to the common metering shaft. (see applicator instructions).

- 4. Install the applicator boxes on the frame.
- 5. Install the metering shaft between each box.
- 6. Install the material tubes to the bottom of the boxes.
- 7. Tighten all mounts and fasteners.
- 8. Install all shields.



7 TROUBLE SHOOTING

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

7.1 MACHINE TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
All hydraulic feeds do not run	Hydraulic lever on tractor in neutral position.	Place hydraulic lever in work position.
NOTE: this will not indicate an electrical problem	Hydraulic hose not connected.	Plug hose into tractor
NOTE : Hydraulic feed is equipped with a one way check valve to prevent system from running in reverse	Operator is attempting to operate hydraulic drive in reverse.	Run hydraulic drive in proper direction.
	One way check valve malfunctioning	Replace check valve. (Valve is located behind hydraulic coupler on inlet line).
	Malfunctioning hydraulic coupler.	Check coupler for foreign object, replace if necessary
	Malfunctioning tractor hydraulic coupler	Plug couplers into another valve if available, check with tractor dealer
	Hydraulic flow control set too low or shut off.	Increase hydraulic flow
One hydraulic drive does not run, all others O.K.	Potato seed piece has wedged electric control switch in closed position.	Remove wedged potato seed piece. Note: If this is a common problem, readjust electric switch
	Malfunctioning control switch.	If unit doesn't run while in "ON" position, replace switch
	Malfunctioning hydraulic motor	Replace hydraulic motor
	Broken drive chain	Repair or replace chain
	Malfunctioning solenoid valve on hydraulic motor	Replace solenoid
One hydraulic drive runs continuously, all others normal	(No power at switch). Broken or unplugged wire between junction box and row unit switch (Power at switch). Bad switch	Plug wire back in. Repair broken wire. Correct problem that broke wire. Replace switch (see page 61)
	(Power at switch, no power at solenoid). Broken wire between junction box and solenoid.	Repair broken wire, correct problem that broke wire.
	Seed piece wedged between switch plate and seed bowl.	Remove seed pieces. Adjust switch plate UP if problem continues.

PROBLEM	CAUSE	SOLUTION
All hydraulic drives will not run	Main wire harness broken,	Repair broken wire. Plug wire
NOTE: When checking for	unplugged Fuse blown.	back in. Replace fuse, check for reason
electrical problems, it is		fuse blew.
suggested that a continuity tester		
and test light be used.	Defective ON-OFF switch	Replace switch in switchbox
Planter has too many misses,	Bent or broken picks.	Replace picks Find reason for
empty picks		damaged picks; rocks in seed, etc
	Picks in wrong position for seed	Change pick position (see page
	Planting speed too slow. Seed	Increase planting speed.
	cutter improperly adjusted.	Readjust seed cutter
Seed drops OFF picks before reaching release point. (Early drop).	Picks in wrong position.	Change pick position (see page 38)
	Planting speed too slow.	Increase planting speed
	Pick wheel to drive sprocket clearance too tight	Readjust drive sprocket clearance (see page 55)
Planter picking too many doubles	Picks in wrong position.	Change pick position (see page 38)
	Seed cut too small.	Readjust seed cutter.
	l oo much seed in seed bowl	Reduce amount of seed in seed bowl (see page 41)
Planter wheel carrying seed around that is not on picks.	Planting speed too fast.	Slow down planting speed
	Too much seed in seed bowls	Reduce amount of seed in seed bowl. (See page 41)
Feed chain constantly over-fills seed bowl.	Feed chain running too fast	Slow down feed chain (see page 40)
One or more pick arms not	Missing cam roller	Replace cam roller
opening	Broken arm, misadjusted cam	Replace, readjust cam
One or more pick arms not	Broken pick arm spring	Replace spring
closing	Damaged pick arm	Replace pick arm
	Foreign object wedged behind	Clean out pick arm
Soil plugging between gauge	pick arm.	Rework field if possible
wheels and planter shoe.		
Uneven planting depth	Front of planter frame too low.	Lift planter hitch slightly
One row unit not planting all	Field condition too soft.	Rework field to improve seedbed.
others normal	bloken snear bolts	(see page 57)
Poor seed placement. Number of seed pieces is correct but	Excess speed.	Slow down.
placement is unacceptable.	Worn planter shoe	Rebuild or replace shoe.
	Closing discs are set too deep (distributing seed furrow).	Set closing discs to a shallower position.
Seed piece depth uneven, seed is at different depths in hill	Closing discs set too close together or at too much of an angle (filling in seed furrow before seed drops).	Readjust closing discs.
	Front of planter frame is too low.	Raise front of planter slightly.

PROBLEM	CAUSE	SOLUTION
Console will not turn on	Console not connected to 12V.	Console must be connected to 12V. Console must be connected directly to battery. Do not connect to convenience outlet in tractor.
	Broken wire.	Check all connections. Repair broken wire.
	Poor or corroded connection	Clean connection. Always coat electrical connections with dielectric grease Replace corroded wire.
	Blown fuse	Find cause of blown fuse. Replace fuse.
Console comes on momentarily, no display	Poor battery connections	Clean / repair connections as needed.
	Weak tractor battery	Console must have 12 V. D.C. Charge or replace battery as needed.
	Console not programmed	Turn console power on, hold up arrow until display appears. See Console Program section (page 27) to program console.
Console turns on, no response from "Increase/Decrease Switch"	"Select Switch" in "OFF" or "AUTO" Position	"Select Switch" must be in "Manual" position.
	No hydraulic flow	Be sure tractor hydraulics are on. Check for hydraulic flow. Hoses must be plugged into tractor correctly (check-valve is on inlet hose).
	Main cable or valve wire disconnected	Check all wire connections.
	Console not properly programmed	Check all program numbers. Check initial program by depressing "Utility Menu". Check program by depressing "Data Menu".
	Console wires not connected to battery.	Console must be connected directly to battery. Do not connect to convenience outlet in tractor.
	"Master Switch" and/or "Product Switch" off	Turn "Master Switch" & appropriate "Product Switch" on.
Console works in "Manual", not in "Auto"	No "Test Speed" in program	See programming section (Page 27) for help programming a "Test Speed"

7.2 RAVEN CONTROL SYSTEM TROUBLE SHOOTING

RAVEN CONTROL SYSTEM TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Planter will run with console in manual mode, will run with test speed, but will not run when tractor is moving.	Radar disconnected	Connect radar cable
	Radar not properly mounted	Check Raven manual for proper radar mounting procedure. Radar must have clear view. See page 25
Planter runs properly in test speed, does not respond to forward movement	Radar disconnected	Check radar cable.
	Defective radar	Replace radar.
	Defective interface cable (when using tractor radar)	Repair or replace interface cable.
Raven console speed does not read the same as tractor speed, seed spacing does not match rate chart	Incorrect Speed Cal	See programming section (page 27) for help programming Speed Cal value.
Planter runs correctly in "Manual", but overspeeds in "Auto". Off Rate warning/ "0's" in rate window	Encoder wire disconnected	Re-connect encoder wire.
5	Encoder shaft coupling loose	Tighten encoder shaft coupling.
	Defective encoder	Replace encoder.
Planter runs correctly in manual - starts, stops, or does not hold constant speed in "Auto"	Encoder shaft coupling loose	Tighten encoder shaft coupling.
	Defective encoder	Replace encoder.

RAVEN CONTROL SYSTEM TROUBLE SHOOTING

Console does not maintain constant speed in field	Poor connection on radar cable	Check/clean connection on radar cable.
	Radar incorrectly mounted	See radar mounting instructions on page 25.
	Defective or incorrect radar interface cable from tractor radar	Contact Harriston Industries for correct interface cable.
	Defective radar	Replace radar.
System does not respond to increase in field speed – console shows "Off Rate" when field speed increases	Tractor oil flow set too low	Increase tractor oil flow approx. 10%.
	High PWM Offset value set too low	Increase value 10 points at a time until problem is corrected. See programming section (page 27) for help programming High PWM Offset value.
Planter does not stop completely when tractor stops, does not correlate with ground speed when slowing down	Tractor oil flow set too high	Reduce oil flow from tractor in approx. 10% increments until problem is corrected. Oil flow should be set at 10 G.P.M.
	PWM Valve defective	Replace PWM Valve.
Planter creeps when tractor stops, planter stops creeping when Master Switch is turned off	Low PWM Offset value set too high	Decrease value by 5 points until problem is corrected See programming section (page 27) for help programming Low PWM Offset value
Planter creeps when stopped. Does not help to reduce Low PWM Offset	Tractor hydraulic system may be causing over pressure	Turn Open/Close bypass valve to open. Most tractors with pressure/flow compensated system can be safely operated with valve in open position. Check with Harriston Service Depart.
	Tractor hydraulic flow set too high	Reduce hydraulic flow from tractor.
	Defective hydraulic valve	Replace hydraulic valve.

RAVEN CONTROL SYSTEM TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Planter creeps when Master Switch is off (Tractor standing	Tractor oil flow set too high	Reduce tractor oil flow by approx. 10%
Suny	Defective PWM Valve	See section on servicing PWM Valve (page 63) or Replace defective valve
Planter delays on startup	Planter switch set on "Delay"	Put planter switch to "ON" position
Planter drive does not work or works incorrectly after rain or period of non-use	Loose or corroded wire connections	Disconnect and clean all connections with electrical contact cleaner. Coat all connections with dielectric grease. Reconnect & tighten all connections
	Moisture has entered damaged wiring cable	Locate damaged cable, repair or replace as required. Coat all connections with dielectric grease.
Planter starts slow, plants & stops properly	Low PWM Offset too low	Increase Low PWM Offset 5 points at a time until planter creeps when tractor stops moving, then decrease Low PWM Offset by 2 points or until planter stops creeping
	Preset Offset too low	Increase Preset Offset by 5 points until planter starts properly. Do not increase above 95
Planter will not stay at target rate when speed increases	Hydraulic oil flow too low	Increase Hydraulic oil flow in 10% increments until planter stays at target rate at desired planting speed. Do not set higher than necessary.
"ro" warning flashes/ alarm sounds	One or more rows not planting	Correct planting problem Check seed level Check feed chain Check row unit drive
	Monitor eye(s) dirty	Clean eye(s)
	Setting for monitor feature incorrect	If monitor feature is not used, "0" must be entered in the ro area in the Data Menu. If monitor feature is used, the number in the ro area in the Data Menu must match how many rows your planter has.
Har	riston Sarvica Dapart	ment

Harriston Service Department 1-800-437-8205

Raven Service Department 1-800-243-5435

8 SHIPPING AND ASSEMBLY

If the machine is shipped by truck, certain components are removed to bring the unit to the legal transport width. Although the machine is heavy, it is not difficult to handle by following this procedure:

- 1. Clear the area of bystanders.
- 2. Spread the forks on the forklift as wide as possible to match the frame clearance points.

3. Drive the forklift to the machine and slide the forks under the frame but away from moving parts. Do not lift on any of the row units or drives.

- 4. Attach a couple of chains or slings between the frame and mast to prevent tipping.
- 5. Lift slightly to tighten the chains.

6. If using a crane or hoist, attach chains to frame at 3 or 4 locations to prevent tipping.

- 7. Lift slightly to tighten the chain.
- 8. Loosen and release all machine tie-downs.
- 9. Slowly raise the machine to lift it slightly above the truck bed.
- 10. Be sure the unit is balanced before moving.
- 11. Raise the machine until the truck bed is cleared.

12. Back slowly always and carefully move to the assembly area. Carry close to the ground when moving to minimize the tendency to tip.

13. Lower the machine to the ground at the assembly site but do not unhook until the rear wheels are mounted.

ASSEMBLY

- 1. Open the crate and cartons containing the attaching components and mounting hardware.
- 2. Determine the machine row spacing required.
- 3. Mark the center of the frame and measure toward each end to establish the positions for the rear wheels.
- 4. Install the rear wheels and tighten the U-bolts to their specified torque.
- 5. Be sure the frame stands are pinned in their supporting position.
- 6. Lower the machine to the ground and remove chains or slings.
- 7. Tighten all U-bolts to their specified torque.

8. Install the rear platform and ladder and tighten mounting bolts to their specified torque.

9. Install optional equipment as required. The Harriston Potato Planter uses ground wheels or hydraulic drive to transmit power to a series of picks that select and meter seed for planting. It is a simple and reliable system that requires minimal maintenance.



1. Keep bystanders away.

2. Use a forklift, crane, or hoist with adequate lift capacity and stability to handle the machine.

3. Securely chain the frame to the lifting device before moving.

4. Use 2 men when handling the machine.

9 SPECIFICATIONS

9.1 BOLT TORQUE

CHECKING BOLT TORQUE

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

ENGLISH TORQUE SPECIFICATIONS

Bolt			Bolt T	orque		- 0	
Diameter	SA	E 2	SA	E 5	SA	SAE 8	
"A"	N.m.	(lb-ft)	N.m.	(lb-ft)	N.m.	(lb-ft)	
1/4"	8	(6)	12	(9)	17	(12)	
5/16"	13	(10)	25	(19)	36	(27)	
3/8"	27	(20)	45	(33)	63	(45)	
7/16"	41	(30)	72	(53)	100	(75)	
1/2"	61	(45)	110	(80)	155	(115)	
9/16"	95	(70)	155	(115)	220	(165)	
5/8"	128	(95)	215	(160)	305	(220)	
3/4"	225	(165)	390	(290)	540	(400)	
7/8"	230	(170)	570	(420)	880	(650)	
1"	345	(225)	850	(630)	1320	(970)	



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

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

9.2 HYDRAULIC FITTING TORQUE

TIGHTENING FLARE TYPE TUBE FITTINGS *

1. 2.	Check flare and flare seat for defects that might cause leakage. Align tube with fitting before tightening.	Tube Size OD	Nut Size Across Flats	Torque	Value*	Recomi Turns to (After fin	mended b tighten ger tight)
~		(Inch)	(Inch)	(N.m.)	(lb-ft)	(Flats)	(Turns)
3.	Lubricate connection and hand tighten swivel	3/16	7/16	8	6	1	1/6
	nut until shug.	1/4	9/16	12	9	1	1/6
4.	To prevent twisting the tube(s), use two	5/16	5/8	16	12	1	1/6
	wrenches. Place one wrench on the	3/8	11/16	24	18	1	1/6
	connector body and with the second tighten	1/2	7/8	46	34	1	1/6
	the swivel nut to the torque shown.	5/8	1	62	46	1	1/6
*	The tergue values shown are based on	3/4	1-1/4	102	75	3/4	1/8
	lubricated connections as in reassembly.	7/8	1-3/8	122	90	3/4	1/8

9.3 MECHANICAL

		4 Row	6 Row	8 Row
Height	Without Hopper Ext. With Hopper Ext.	7' 8" (2.3m) 8' 8" (2.6m)	7' 8" (2.3m) 8' 8" (2.6m)	7' 8" (2.3m) 8' 8" (2.6m)
Width		16' 8" (5.0m)	21' 8" (6.6m)	36" Rows 25' 4" (7.8m) 40" Rows 28' 0" (8.5m)
Length	Pull Type Front to Rear In Field Position	18' 0" (5.5m)	18' 0" (5.5m)	19' 2" (5.8m)
Weight	Empty (Estimated)	7,600 lbs. (3455 kg)	11,900 lbs. (5409 kg)	15,600 lbs. (7090 kg)
Seed Cap	bacity (without ext.)	70 cwt.	112 cwt.	150 cwt.
Recomm H.P. (Mini	ended Tractor imum)	90	130	160
Tires (Dri	ve)	9.5 x 24" 25 psi (172 kPa)	9.5 x 24" 25 psi (172 kPa)	N/A
Tires (Ga	uge Wheel)	5.70 x 4.00 x 8" 4.80 x 4.00 x 8" 50 psi (345 kPa)	5.70 x 4.00 x 8" 4.80 x 4.00 x 8" 50 psi (345 kPa)	5.70 x 4.00 x 8" 4.80 x 4.00 x 8" 50 psi (345 kPa)
Seed Spa	acing	Hydraulic Optional or Ground Drive	Hydraulic Optional or Ground Drive	Hydraulic Optional or Ground Drive
Planting	Capacity	Up to 7 acres/hour (2.8 ha/hour)	Up to 12 acres/hour (4.8 ha/hour)	Up to 16 acres/hour (6.4 ha/hour)
Planting	Planting Speed 4 to 6.5 mph (6 to 11 km/h) recommended speed			

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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