

Safety, Operations, & Troubleshooting sections from:

FLEXII DRILLS

OPERATOR'S MANUAL

PARTS CATALOG

MANUAL #5999

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SAFETY

RECOGNIZE SAFETY INFORMATION

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, become alert, as your safety is involved.

Follow recommended precautions and safe operating practices.



SAFETY ALERT SYMBOL

UNDERSTAND SIGNAL WORDS

These are typical safety signs that appear with the safety-alert symbol and signal words (**DANGER**, **WARNING**, and **CAUTION**). Safety signs are displayed to alert the operator and others of the risk of personal injury during normal operations and servicing.

DANGER identifies the most serious potential hazard. The sign is displayed in the area of the hazard.

WARNING identifies a serious hazard. The sign is displayed in the area of the hazard.

CAUTION is used for a general reminder of good safety practices or to direct attention to unsafe practices.



TYPICAL SAFETY SIGNS

SAFETY FIRST!

Carefully read, understand, and follow all safety instructions in each section prior to setting up, transporting, and operating your drill.

It is important that no one be allowed to operate **Truax** equipment until they have been properly trained on the safe operation of this equipment. All operators must clearly understand the importance of replacing all guards and safety devices before operating the equipment.





SAFETY

SAFETY PRECAUTIONS

For your own safety and to avoid harm to yourself and others, please observe the following safety precautions:

- 1) **DO NOT** operate this drill without reading this Operator's Manual!
- 2) **DO NOT** operate this drill with anyone riding on the drill!
- 3) **DO NOT** operate drill when other people are near the drill!
- 4) **DO NOT** obstruct or paint over safety decals!
- 5) **DO NOT** operate machinery without guards and safety devices as injury may result!
- 6) **DO NOT** operate drill with lids open - injury may result!
- 7) **DO NOT** tow over 20 m.p.h. as tire, wheel, and/or bearing failure may result!
- 8) **DO NOT** operate without chain guards as injury may result!
- 9) Use caution when operating close to fences, tree lines, ditches or streams.
- 10) Reduce operating speed on inclines and rough terrain and shift to a lower gear before going up or down steep slopes.
- 11) Slow down when turning.
- 12) **DO NOT** turn sharply! Check the clearance between the tractor tire and the tongue when turning.
- 13) Install safety chains between the drill and the towing vehicle. Follow the tractor manufacturer's instructions for proper hookup to the tractor.
- 14) Use extra caution when moving farm equipment on roadways.
- 15) Be careful of over-sized equipment on narrow bridges.
- 16) When moving on a trailer, over-sized equipment must be permitted, flagged, and have approved lights.
- 17) **NEVER** work in or near seed boxes while tractor is running!
- 18) When servicing the drill (when it is attached to the tractor), turn the tractor "**off**" and put it in gear or park.
- 19) When servicing the drill (when detached from the tractor), block both wheels (front and rear) and secure the tongue.



SAFETY

20) Securely support drill, block wheels (front and rear), and restrain tongue when performing the following work:

- Elevating the end of the drill to calibrate it.
- Changing a tire.
- Replacing or repacking wheel bearings.
- Changing furrow openers or no-till coulter assemblies.

21) **AVOID HIGH PRESSURE FLUIDS:**

Hydraulic systems operate under high pressure. Fluid leaking from around connections and pinholes may penetrate the skin, causing infection and serious injury. See a doctor immediately if hydraulic fluid penetrates the skin.

Relieve pressure from hydraulic systems before disconnecting or servicing hydraulic lines. Ensure that all connections are tight and that the hoses are not damaged.



22) **USE EXTREME CAUTION** when working near or handling double disc furrow openers or no-till coulters! Wear leather gloves! ***SHARP EDGES ON BLADES COULD RESULT IN SERIOUS INJURY!***

23) For safety and to reduce wear on the clevis, always install and maintain the **hitch clevis** (part #1022B2) below the **hitch body** (part #1022C2) as illustrated on Page 90-17 so the hitch body carries the tongue weight.



SAFETY

HIGHWAY AND TRANSPORT PRECAUTIONS

- 1) Adopt safe driving practices:
 - Keep the tractor brake pedals latched together at all times. **Never use independent braking with machine in tow, as loss of control and/or upset of unit may result!**
 - Always drive at a safe speed relative to local conditions and ensure that your speed is low enough for an emergency stop to be safe and secure. Keep speed to a minimum.
 - Reduce speed prior to turns to avoid the risk of overturning.
 - Avoid sudden uphill and downhill turns on steep slopes.
 - **DO NOT** coast! Always keep the tractor or towing vehicle in gear to provide engine braking when going downhill.
 - **DO NOT** eat, drink, or use a cell phone while driving!
- 2) Comply with state and local laws governing highway safety and movement of farm machinery on public roads.
- 3) Use approved accessory lighting flags, and necessary warning devices to protect operators of other vehicles on the highway during day and night transporting. Various safety lights and devices are available from your dealer.
- 4) The use of flashing amber lights is acceptable in most localities. However, some areas may prohibit their use. Local laws should be checked for all highway lighting and marking requirements.
- 5) When driving the tractor and equipment on the road or highway under 20 m.p.h. at night or during the day, use flashing amber warning lights and a slow moving vehicle (**SMV**) identification emblem.
- 6) Always tow with a vehicle that is heavier than the drill.
- 7) Implement tires are designed for field use and will not stand up under sustained highway travel.
- 8) Rotate jack on tongue, or remove jack from tongue.
- 9) Always raise the drill openers to the highest position and secure the hydraulic cylinders with the transport channel locks before transporting the drill.
- 10) Plan your route to avoid heavy traffic.
- 11) Be a safe and courteous driver. Always yield to oncoming traffic in all situations, including narrow bridges, intersections, etc.
- 12) Be observant of bridge loading ratings. **DO NOT** cross bridges rated lower than the gross weight at which you are operating. Know the weight of your tractor and drill.
- 13) Watch for overhead and side obstructions while transporting.
- 14) Always operate equipment in a position to provide maximum visibility at all times. Make allowances for increased length and weight of the equipment when making turns, stopping the unit, etc.



SET-UP & PREPARATION

PREPARING THE TRACTOR

- 1) Make sure all tractor "power take-off" (PTO) guards are in place.
- 2) Retain drawbar in a fixed position.
- 3) Place tractor drawbar in a position so that the drill frame is nearly level.
- 4) Attach safety chain from tractor to drill.
- 5) Secure the tractor lift links.
- 6) Install tractor "slow moving vehicle" (SMV) emblem.

ATTACHING THE DRILL

- 1) Secure the drill to the drawbar with a pin that has a cross-locking device to prevent the units from separating.
- 2) Attach safety chain between the drill and the tractor. Safety chain is not a standard item but is available as an option.
- 3) Tractor drawbar height may require the tongue clevis to be raised or lowered.
- 4) The drill tongue will generally slope down toward the tractor. An important consideration is to have approximately equal force or pressure exerted by the planter discs and the press wheels.
- 5) The drill frame should be nearly level when the drill openers are in the planting position. This can be checked by positioning the drill on a flat surface with a 2" x 6" under each wheel. Lower the drill planting units to the ground surface and check to see if the disk openers and no-till coulters are touching the ground surface equally.

If adjustment is needed proceed in the following sequence:

1. First, check the hitch clevis and adjust up or down if possible.
 2. Second, check to insure the no till coulters are adjusted to the proper height.
 3. Third, adjust the leveling spring assembly as discussed in Item 6.
- 6) Adjust the leveling spring assembly in the tongue. Turning both the upper and lower sets of nuts downward toward the tongue will raise the front of the drill. Turning both the upper and lower sets of nuts upward toward the drill will lower the front of the drill.
 - 7) Be sure the hydraulic hoses are secured and out of the way of the tongue and the tires. A hose guide is attached to the tongue to help support the hydraulic hoses.
 - 8) Rear drive and rear transport drills require an additional pair of hydraulic hoses independently controlled. On rear drive drills a 2-1/2" x 8" hydraulic cylinder is mounted in place of the spring leveler to raise the front of the drill for transport. Care must be used when lowering the rear drive drill for planting in order to level the drill for proper penetration of both the no-till and the disc openers. **A slight miss-adjustment of the front hydraulic cylinder will dramatically effect the penetration of the discs and no-till units.**
 - 9) Check 3/8" x 3" bolts and nuts that retains axles to legs. Loctite should be applied after tightening the bolts or pean threads. **Check these bolts periodically (every 100 acres) and tighten as necessary.** Replace the nuts with a locking style nut if they frequently become loose.
 - 10) Check the wheel lug nuts. Torque is 75-85 lbs. and should be checked after the 1st and 2nd day of use and again after 50 and 100 acres. After that, check periodically to ensure lug nuts are tight.



SET-UP & PREPARATION

TRANSPORTING THE DRILL

- 1) Raise the drill to the highest position and install **both** hydraulic **transport channel locks**. Rear drive drills require a third **transport channel lock** (for tongue hydraulic cylinder). Be sure to install them before transporting the drill.
- 2) Be sure that the drill's "slow moving vehicle" (**SMV**) emblem is clean and visible.
- 3) Attach safety chain between the drill and the towing vehicle.
- 4) When roading a drill for more than 1/4 mile, it is essential to disengage the sprocket lockout hub.
- 5) When starting out in the transport mode, insure that the clutch is disengaging the drive and the shafts are not turning.
- 6) Make sure that the drill reflectors are clean and in place.
- 7) **NEVER** transport the drill faster than **20 m.p.h.** unless the drill is on a trailer.
- 8) **DO NOT** transport or haul the drill with seed in boxes, as this will cause settling and packing, which is hard on drive chains when planting is resumed.
- 9) **DO NOT** leave seed sacks (empty or partially full) in seed boxes as they may become entangled in the agitators during transport.
- 10) Be extremely cautious when crossing narrow bridges.
- 11) When towing the drill on roadways, it is important to watch ground clearance (especially on a crowned road or one that has low shoulders). A towed drill should be secured to the towing vehicle with a safety chain.
- 12) Transport on a trailer requires chaining or strapping the drill's main frame (**not the seed boxes**) to the trailer. Raise end wheels so that planters are on trailer deck. Fasten red flags to oversized units. Follow all state and local regulations when transporting a drill.
- 13) Secure box lids with an additional rope or rubber tie downs (**not the seed box cover lid retainers**) when moving the drill on the highway. The seed box cover lid retainers may break due to excessive bounce if hooked during transport.



OPERATING THE DRILL

SEED PLACEMENT

OPENER PENETRATION

Truax drills are equipped with depth bands on all disc openers. Depth bands help control the penetration of the discs into the soil surface and thus control planting depth. The standard size provided since 1/1/98 is 12" in diameter, allowing 3/4" of penetration of the blade. Seeds will drop into the seed slot, about half the amount of disc penetration, for a planting depth of approximately 3/8". For most conditions when planting grasses and legumes the **12" band diameter** (part #1097C) is all that will be necessary.

Optional depth bands are available in diameters of: 9-1/2" (part #1097F), 10-1/2" (part #1097D), 11-1/2" (part #1097), and 12-1/2" (part #1097A).

PRESS WHEELS

RUBBER "V" PRESS WHEEL (1.75" x 10"):

These are the standard press wheels used in most field situations. This press wheel firms the seeds into the sides of seed slot by crushing loose soil crumbs down on top of newly planted seed. This press wheel does the best job of locking out air from around the seed and locking in any available moisture. The semi-pneumatic feature resists mud buildup and therefore is the best all-around press wheel. **Rubber press wheel assembly** (part #1034A1-Black) or (part #1034A-Yellow) includes the assembled press wheel and mounting frame.

CAST IRON PRESS WHEEL (1" x 12"):

The angular mounted iron press wheel is used for planting seed deeper (1-1/2" to 2") and would typically be used for planting larger seeded crops like soybeans. This press wheel may also be useful when planting in **hard, cloddy soils** to break up the soil crumbs enough to allow soil covering. It is especially useful in hard, crusty soils where there isn't sufficient loose soil to cover the seed. It is successfully used in some no-till applications on clay or clay loam soils. **Cast iron press wheel assembly** (part #1034A3) includes the assembled press wheel and mounting frame.

LEADING PRESS WHEEL (4" x 16"):

A semi-pneumatic press wheel interchanges with a caster style no-till to pack loose soil before the double disc places the seed. **Leading press wheel assembly** (part #0422031) includes the assembled press wheel and mounting frame.

WEIGHT TRANSFER

The end wheels hydraulically raise, placing weight from the drill on the furrow openers and tongue. The amount of weight transfer to the furrow openers versus the end wheels determines the penetration force of the disc openers. Adding cylinder stops to the two rephasing cylinders that lift the drill for transport can control weight transfer. Adding cylinder stops places additional weight on end wheels when planting and limits weight on discs.

Rear drive drills use a third hydraulic cylinder on the tongue that raises the front of the drill and also transfers the drill weight and therefore increases or decreases penetration of the discs.



OPERATING THE DRILL

DOUBLE DISC OPENERS

The disc openers create a "V" groove in the soil surface for the seed to be dropped. Discs are 13-1/2" in diameter when new. **Disc blades should be replaced when wear reduces the diameter to 13".** Refer to Service and Maintenance instructions for disc opener maintenance and replacement.



Bearing failure will result if fertilizer is placed into one of the seed boxes and comes into contact with the discs.

Critical soil to seed contact is a major function of the disc openers. Therefore, daily inspection and service is required to maintain the disc openers.

SEED CALIBRATION AND METERING

SEED CALIBRATION PROCEDURE:

- 1) Truax drills have been designed to operate using all three boxes (fluffy, small seed, and cool season/grain) simultaneously or in any combination desired.
- 2) When using the drill, it is important to remember that when the clutch is engaged, the mechanisms in all seed boxes operate and deliver seed through the seed hoses.
- 3) To avoid errors during calibration, **calibrate each seed box individually**. Changing the calibration of one box does not affect the other boxes.
- 4) First, calibrate the small seed box, then the cool season box (when installed), and finally the fluffy box.
- 5) All Truax drills can be calibrated using the same procedure. **Refer to "Calibration Procedures" for more detail.**

METHODS OF CALIBRATION:

- 1) Weight/Acre in Grams
- 2) Weight/Acre in Ounces
- 3) Seeds Per Row Foot
- 4) Trial Seeding/Bag



OPERATING THE DRILL

FACTORS AFFECTING SEEDING RATE CALIBRATION

Several factors will affect the seeding rate. These include humidity, seed density, seed purity (inert matter in seed lot), seed germination, mixing of seed types, seed box used, site conditions, and speed of travel.

For more precise calibration, two or more of the calibration methods should be used, and repeated several times a day. It is **not recommended** that suggested procedures be used when controlled "plot planting" is being done.



The procedures provided for the calibration of Truax drills are to be used as a guide only - as several factors could affect the rate at which the seed will flow through the seedway passages.

The operator of the equipment must constantly monitor the seed delivery and placement!

SEEDING RATE VARIABLES:

- 1) Different bags of seed weighing the same amount may contain different amounts of pure live seed, due to seed germination, seed purity and inert material, unfilled kernels, moisture content, or seed size.
- 2) The drill wheels may slip due to seedbed condition, soil type, lay of the land (i.e. slope), and speed of drilling.
- 3) The tire size, type, pressure and tire wear will affect the seeding rates. Note: The standard tire is a 7.60x15 Rib Implement style.
- 4) Leaving a gap wider than the drill row spacing between drill passes, overlapping drill passes, and failure to fully stop and lift the drill when turning at the end of the field will affect uniform seed distribution.
- 5) The operator may have false information as to the land area.

IMPORTANT: Remember that the feed cups meter volume, not weight!

PRELIMINARIES TO CALIBRATION (WEIGHT/ACRE)

- 1) Attach the drill to a tractor or other vehicle, park on a level surface, set parking brake, and shut off engine.
- 2) Lower the drill to the planting position. Drill cannot be calibrated in transport position because clutch is disengaged.
- 3) Block the non-drive end wheel (both front and rear.).
- 4) Using a jack under the pad welded to the bottom front side of the drive leg (production after 01-01-2000), lift drill frame so that the drive end wheel is lifted off the ground. On drills produced before 01-01-2000 place a jack stand under the front, right corner (drive side) of the drill when in the transport position. This will raise the drive wheel off the ground when lowered to planting position and ease calibration.
- 5) Remove seed hoses from three aluminum transitions.
- 6) **Only** place seed in drill box compartment over the three seed tubes previously removed. Use enough seed to fill to the top of agitators in the box being calibrated.
- 7) Turn the drive wheel and check to be sure that all mechanisms are working. Check to see that seed falls from the three transitions.



OPERATING THE DRILL

CALIBRATION PROCEDURE FOR 8" ROW SPACING (GRAMS)

- 1) Disconnect the front and rear seed box hoses from three aluminum transitions. Place a bag or can to catch the seed under each of the three (3) aluminum transitions and the three (3) seed cups from the front and rear seed boxes if used.
- 2) Measure the circumference of the drive wheel in feet. Divide 96 by the wheel circumference in feet to determine the number of wheel revolutions. Example: Wheel circumference is 7.25 ft.; 96 divided by 7.25 equals 13 ¼ wheel revolutions.
- 3) Use the valve stem or a paint mark on the wheel to keep track of the revolutions. Turn the drive wheel the required number of revolutions determined in step #2.
- 4) Combine the seed from the three rows of each seed box into separate containers.
- 5) Weigh the collected seed in grams.
- 6) Divide the weight by two (2).
- 7) The result equals the seeding rate in **bulk pounds per acre**. This is not Pure Live Seed (PLS).
- 8) Repeat at least three (3) times and determine an average output per box.
- 9) See Pages 30-9 and 30-10 for adjusting seed flow from each seed box.

CALIBRATION PROCEDURE FOR 8" ROW SPACING (OUNCES)

- 1) Disconnect the front and rear seed box hoses from three aluminum transitions. Place a bag or can to catch the seed under each of the three (3) aluminum transitions and the three (3) seed cups from the front and rear seed boxes if used.
- 2) Measure the circumference of the drive wheel in feet. Divide 217.80 by the wheel circumference in feet to determine the number of wheel revolutions. Example: Wheel circumference is 7.25 ft.; 217.80 divided by 7.25 equals 30 wheel revolutions.
- 3) Use the valve stem or a paint mark on the wheel to keep track of the revolutions. Turn the drive wheel the required number of revolutions determined in step #2.
- 4) Combine the seed from the three rows of each seed box into separate containers.
- 5) Weigh the collected seed in ounces.
- 6) Multiply the results by 6.25.
- 7) The result equals the seeding rate in **bulk pounds per acre**. This is not Pure Live Seed (PLS).
- 8) Repeat at least three (3) times and determine an average output per seed box.
- 9) See Pages 30-9 and 30-10 for adjusting seed flow from each seed box.



OPERATING THE DRILL

CALIBRATION PROCEDURE FOR 10" ROW SPACING (GRAMS)

- 1) Disconnect the front and rear seed box hoses from three aluminum transitions. Place a bag or can to catch the seed under each of the three (3) aluminum transitions and the three (3) seed cups from the front and rear seed boxes if used.
- 2) Measure the circumference of the drive wheel in feet. Divide 77 by the wheel circumference in feet to determine the number of wheel revolutions. Example: Wheel circumference is 7.25 ft.; 77 divided by 7.25 equals 10 ½ wheel revolutions.
- 3) Use the valve stem or a paint mark on the wheel to keep track of the revolutions. Turn the drive wheel the required number of revolutions determined in step #2.
- 4) Combine the seed from the three rows of each seed box into separate containers.
- 5) Weigh the collected seed in grams.
- 6) Divide the weight by two (2).
- 7) The result equals the seeding rate in **bulk pounds per acre**. This is not Pure Live Seed (PLS).
- 8) Repeat at least three (3) times and determine an average output per box.
- 9) See Pages 30-9 and 30-10 for adjusting seed flow from each seed box.

CALIBRATION PROCEDURE FOR 10" ROW SPACING (OUNCES)

- 1) Disconnect the front and rear seed box hoses from three aluminum transitions. Place a bag or can to catch the seed under each of the three (3) aluminum transitions and the three (3) seed cups from the front and rear seed boxes if used.
- 2) Measure the circumference of the drive wheel in feet. Divide 174.25 by the wheel circumference in feet to determine the number of wheel revolutions. Example: Wheel circumference is 7.25 ft.; 174.25 divided by 7.25 equals 24 wheel revolutions.
- 3) Use the valve stem or a paint mark on the wheel to keep track of the revolutions. Turn the drive wheel the required number of revolutions determined in step #2.
- 4) Combine the seed from the three rows of each seed box into separate containers.
- 5) Weigh the collected seed in ounces.
- 6) Multiply the results by 6.25.
- 7) The result equals the seeding rate in **bulk pounds per acre**. This is not Pure Live Seed (PLS).
- 8) Repeat at least three (3) times to determine an average output per seed box.
- 9) See Pages 30-9 and 30-10 for adjusting seed flow from each seed box.



OPERATING THE DRILL

CALIBRATION PROCEDURE (SEED PER ROW FOOT)

To calculate the number of seeds per row foot/pound of a specified crop, determine the number of seeds per pound from Table #1. Then, use the following formula:

When:

1 acre = 43,560 square feet

A = number of seeds per pound (from Table #1)

B = number of seeds per square foot/pound per acre

C = planting width of drill

D = number of seeds per one (1) row foot per pound

E = number of rows planted by drill

$$A/43,560 = B$$

$$(C/E) \times B = D$$

For Example: Using big bluestem, which has 165,000 seeds per pound and a FLXII-812 Drill, which has an eight (8) foot planting width and plants twelve (12) rows.

A = 165,000 seeds per pound

C = 8 feet

E = 12 drill openers or rows

B = $165,000/43,560 = 3.8$ seeds per square foot

D = $(8 \text{ ft}/12) \times 3.8 = 2.5$ seeds per one (1) row foot/pound

This figure is actual or bulk seeds per row foot/pound. When planting Pure Live Seed (PLS), divide "D" by the PLS percent of your seed lot.

For Example: Your seed lot of big bluestem has a PLS percent of 60% (0.60).

$$2.5/0.60 = 4.2 \text{ actual or bulk seeds per row foot/pound}$$

This figure represents one PLS pound of seed. Multiply by the desired planting rate per acre to obtain the correct number of seeds per foot of row.

For Example: Your desired planting rate for big bluestem is 8 PLS pounds per acre.

$$4.2 \times 8 = 33.6 \text{ actual or bulk seeds per row foot for an eight (8) PLS pound seeding rate.}$$

In the above example, 34 seeds per row foot would be required to achieve the desired seeding rate.

CALIBRATION PROCEDURE (SAMPLE BAG PER LAND AREA)

- 1) Select or measure a known field area (1-2 acres).
- 2) Put the proper quantity of seed (PLS) in the seed boxes and drill the known field area.
- 3) Check periodically while drilling to see if there is enough material to seed the area.
- 4) Adjust the drill to achieve the desired seeding rate.



OPERATING THE DRILL

TABLE 1 - SEED INFORMATION¹

SPECIES	NUMBER SEEDS PER POUND	SEEDS PER SQUARE FOOT @ 1 POUND PER ACRE ²
<u>Native Warm Season</u>		
Alkali sacaton	1,758,000	40.4
Big bluestem	165,000	3.8
Blue grama	825,000	18.9
Buffalograss (Burs)	56,000	1.3
Eastern gamagrass	7,280	0.17
Indiangrass	175,000	4.0
Little bluestem	260,000	6.0
Prairie cordgrass	183,000	4.2
Prairie sandreed	273,000	6.3
Sand bluestem	113,000	2.6
Sand dropseed	5,289,000	121.4
Sand lovegrass	1,300,000	29.8
Sideoats grama	191,000	4.4
Switchgrass	389,000	8.9
<u>Native Cool Season</u>		
Canada wildrye	115,000	2.6
Green needlegrass	181,000	4.2
Needle-and-thread	115,000	2.6
Reed canarygrass	533,000	12.2
Slender wheatgrass	159,000	3.7
Western wheatgrass	110,000	2.5
<u>Introduced Cool Season</u>		
Creeping foxtail	750,000	17.2
Creeping red fescue	615,000	14.1
Crested wheatgrass	175,000	4.0
Hard fescue	680,000	15.6
Intermediate wheatgrass	88,000	2.0
Kentucky bluegrass	2,177,000	50.0
Meadow brome	71,000	1.6
Orchardgrass	654,000	15.0
Perennial Ryegrass	227,000	5.2
Pubescent wheatgrass	100,000	2.3
Red top	4,990,000	114.6
Russian wildrye	175,000	4.0
Smooth brome	136,000	3.1
Tall fescue	227,000	5.2
Tall wheatgrass	79,000	1.8
Timothy	1,230,000	28.2



OPERATING THE DRILL

TABLE 1 (CON'T) - SEED INFORMATION

SPECIES	NUMBER SEEDS PER POUND	SEEDS PER SQUARE FOOT @ 1 POUND PER ACRE ²
<u>Legumes</u>		
Alfalfa	200,000	4.6
Alsike clover	700,000	16.1
Birdsfoot trefoil	375,000	8.6
Cicer milkvetch	130,000	3.0
Crownvetch	109,000	2.5
Hairyvetch	20,000	0.50
Purple vetch	10,000	0.23
Korean lespedeza	225,000	5.2
Sericea lespedeza	350,000	8.0
Crimson clover	149,700	3.4
Ladino clover	871,650	20.0
Red Clover	275,000	6.3
Strawberry clover	300,000	6.9
Sweetclover	260,000	6.0
White clover	800,000	18.4
<u>Forbs</u>		
Maximillian sunflower	150,000	3.4
Purple prairieclover	275,000	6.3
Pitcher sage	150,000	3.4
Roundhead lespedeza	151,000	3.5
Thickspike gayfeather	110,000	2.5
Dotted gayfeather	141,000	3.2
Shell-leaf penstemon	272,200	6.3
<u>Cereal Grain</u>		
Barley	14,000	0.32
Oats	13,000	0.30
Regreen	11,000	0.25
Rye	18,000	0.41
Wheat	15,000	0.34

1. Source - Grass, USDA Yearbook of Agriculture 1948

2. Seeds Per Sq. Ft @ 1 LB Per Acre - Number of Seeds Per Pound divided by 43,560 Sq. Ft Per Acre



OPERATING THE DRILL

ADJUSTING THE CALIBRATION

SMALL SEED BOX:

The shift lever on the bottom left end of the box exposes or closes the flutes to control the seeding rate. The exposed flute area for each cup (inside the box) should equal at least twice the diameter of the largest seed being seeded from the box. **Carefully control the exposed flute so that no seeds are crushed or ground.** When very low seeding rates are desired from the small seed box, replace the original **sprocket** (part #1055) on the end of the box with a larger **sprocket** (part #1054A). If reduced seeding rates are desired from all seed boxes on the drill add an **Output Reduction Kit** as discussed on page 30-13.

If seed cup shaft walks (moves) left or right when in use, ensure that there is no free play in the shaft. A **machine bushing** (part #MB12-.15 or JD #N160437) next to the **shifter spool** (part #1130) reduces shaft movement. By taking up free play in the shaft and preventing the start of shaft movement, it is easier for the retaining wing nut to hold the shaft in place.

To Correct Irregular Feeding From Different Cups:

First, with the seed cup shaft shifted fully to the left, check if the drive **coupler** (part #1010) is touching the roll pin preventing full movement to the left. When there is contact between the coupler and the roll pin it will be necessary to loosen the set screws of the two bearings holding the coupler and move the coupler slightly to the left. The small seed box chain will then need to be realigned.

Second, if further adjustment is needed loosen up the cup mounting bolts and move the cups so that the exposed flute is the same on all seed cups. This will result in equal feeding from the seed cups. **See Figure 30-1.**

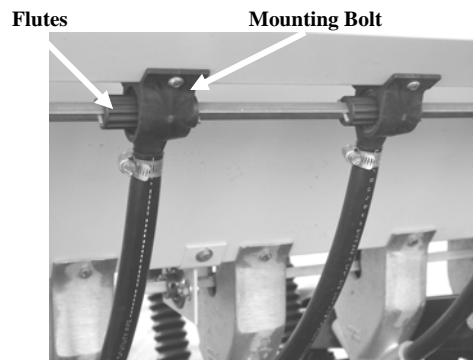


FIGURE 30-1

COOL SEASON OR GRAIN BOX:

Raise the clean-out levers on the left side of the cups to the highest position. Like the small seed box, exposing more of the flutes will result in a higher seeding rate. If irregular feeding is occurring from different cups, adjustment may be made by loosening up the cups and moving them so the exposed flute is the same on all seed cups to produce equal feeding.

If the seeding rate changes during planting, it may be caused from the **feed shaft** (part #3013) moving. This may be caused by a loose or worn **bolt** (part #B38-ISQ), a lost or broken **spring** (part #TS-72M), lost or broken **spring pin** (part #RP18-1.25), a worn or loose **shifter lever** (part #3205), a worn **shifter bearing** (part #M608621), or a worn **thrust washer** (part #TM60826).

When the output of the cool season box can not be reduced low enough, the **double sprocket** (part #3095X) on the drive end of the box can be changed to the **low output sprocket** (part #3095X1). If reduced seeding rates are desired from all seed boxes on the drill, add an **Output Reduction Kit** as discussed on page 30-13.



OPERATING THE DRILL

If the **feed shaft** (part #3103) is difficult or impossible to shift left or right, it may be caused from dust and dirt in the cups or by seed jammed in the flutes. It may be necessary to clean the box and cups before shifting the feed shaft. Application of WD-40 or liquid graphite on contact points will help. Turn **feed shaft** (part #3103) with a 5/8" wrench while shifting.

When planting large seed (such as corn or beans), move the clean-out lever (on the left side of each cup) to the middle or bottom setting to prevent crushing or chipping of the seed, which could result in an irregular seeding rate.

We do not recommend the application of fertilizer with Truax drills.

LARGE (FLUFFY) SEED BOX:

One of the most distinguishing features of the FLEXII style drills is the means to control output from the fluffy seed box. Unlike, earlier production drills which used a double cone gear speed changer to control the output from the fluffy box, the FLEXII drills use a very simple derailleur to vary the RPM of the picker wheel shaft of the fluffy box and thereby the output of seed from the box.

The derailleur controls the output only from the fluffy seed box.

The derailleur consists of (two) five-step sprockets and a spring tension idler that takes the slack from the roller chain between the two stepped sprockets. The idler is on top of the upper chain. There are five settings for seed output from the fluffy seed box. To change output settings, lift the idler and move the chain from one set of sprockets to another. The rear sprocket is the drive and the sprocket closest to the tongue is the driven one. The lowest output RPM, and therefore the lowest seed output is achieved when the chain is on the furthest to the right combination of sprockets (when standing at the tongue looking back). As the chain is moved to different combinations to the left, the drive sprocket diameter increases in relation to the driven and therefore increases the RPM and the seed output.

Additional changes in output from the large, fluffy box can be achieved by:

- 1) Adding **seed gaskets** (part #1005) and **retainer plates** (part #1006) inside the seed box to restrict output.
- 2) Increasing the size of the picker wheel sprocket located under the end cover on the drive side. The standard is a **30 tooth** (part #1055A1) square holed sprocket, and can be changed to a **36 tooth** (part #1055A2) or a **42 tooth** (part #1055A212) sprocket to further reduce output.
- 3) Increasing the clutch sprocket size can reduce the fluffy box output. The standard is a **30 tooth** (part #1044) and can be changed to a **48 tooth** (part #1144E), a **54 tooth** (part #1144A) or a **60 tooth** (part #1144B) sprocket to reduce output.
- 4) Reduced seeding rates from all seed boxes on the drill can be achieved by adding the **Output Reduction Kit** discussed on Page 30-13.
- 5) After adding the seed gaskets and retainer plates, the Output Reduction Kit and/or changing sprockets, if further reduction is needed, it is possible to try one of several fillers such as rice hulls, cotton hulls, bran, or ground corncobs.

Note: Changing the sprocket on the clutch or the leg will affect the acre meter reading.



OPERATING THE DRILL

NOTE: Because of the wide variation in quality and texture of different lots and mixtures of grass seed, it is impractical to supply a seeding rate chart with the drill. With a little experience, each user can work out a chart for the materials used, by calibrating the drill for the job at hand. Follow calibration procedures located inside the fluffy box lid.



The rates shown in the charts are only to be used as a guide. Refer to Box Calibration Procedure in this section for more detail.

The charts are based on original equipment sprockets. Changing sprockets or using the Output Reduction feature will affect drill output.

The charts are based on a drill equipped with 7.60 x 15 inch tires.

Some seeds, such as soybeans and wheatgrass vary widely in size. For such seed types (at a given pound per acre rate), the number of seeds planted per acre will vary according to the size of the seed.

SEEDING CHARTS FOR TRUAX DRILLS FLUTED FEED ROLL – SMALL SEED BOX

TYPE OF BOX	TYPE OF SEED	EXPOSED FLUTE	BULK SEED LBS/ACRE
SMALL SEED BOX Original equipment sprockets. Exposed fluted feed roll measured on inside of cup.	CAVE-IN ROCK SWITCHGRASS P-99.78%, G-84%, PLS-84%	1/2"	6.0
		1/8"	1.5
		1/32"	0.8
SMALL SEED BOX Changed driven sprocket to a 30-tooth from original 20-tooth sprocket.	SAME SEED AS ABOVE	1-1/16"	7.5
		1/2"	3.2
		1/4"	1.78
		1/8"	0.78
SMALL SEED BOX Original equipment sprockets. Exposed fluted feed roll measured on inside of cup.	ALFALFA & LADINO CLOVER	1/2"	27.1
		3/8"	18.9
		1/4"	14.2
		1/8"	7.7
	BIRDSFOOT TREFOIL & CRIMSON CLOVER	1/2"	24.3
		3/8"	17.8
		1/4"	11.8
		1/8"	6.6
	TIMOTHY & RED TOP	1/2"	16.3
		3/8"	11.5
		1/4"	8.1
		1/8"	4.4



OPERATING THE DRILL



The "Sample Feed Rates" provided are to be used as a guide only - as several factors could affect the rate at which the seed will flow through the seedway passages. The operator of the equipment must constantly monitor the seed delivery and placement.

SPEED CHANGER VARIABLES – FLUFFY SEED BOX

TYPE OF BOX	TYPE OF SEED	OUTPUT SETTING	BULK SEED LBS/ACRE
FLUFFY SEED BOX Original equipment sprockets on leg shaft and clutch. DERAILLEUR STYLE SPEED CHANGER When standing in front of drill facing the speed changer: For lowest output, chain should be to the right side of the cone sprockets. The 16-tooth sprocket will be driving the 50-tooth sprocket. Any stepping of the chain to the left increases the output. Each step will increase the output between 40%-60% depending on the purity and germination of the seed. A higher purity will have a greater change in output with each step. Debearded seed will have the same effect.	SHARP'S COMMON MIX BIG BLUESTEM, SIDEOTS GRAMA, & LITTLE BLUESTEM	50 drive 16	54.7
		44 drive 26	28.4
		36 drive 36	16.8
		26 drive 44	10.7
		16 drive 50	5.3
	STOCK'S COMMON MIX BIG BLUESTEM, INDIANGRASS, & LITTLE BLUESTEM	50 drive 16	27.8
		44 drive 26	15.9
		36 drive 36	9.1
		26 drive 44	5.6
		16 drive 50	3.1
	CAMPER LITTLE BLUESTEM P-86%, G-54%, PLS-46.6%	50 drive 16	54.3
		44 drive 26	27.0
		36 drive 36	15.9
		26 drive 44	9.4
		16 drive 50	4.5
	BIG BLUESTEM (Debearded Seed)	50 drive 16	59.5
		44 drive 26	33.9
		36 drive 36	19.4
		26 drive 44	11.0
		16 drive 50	6.3



OPERATING THE DRILL

SEEDING CHARTS FOR TRUAX FLEX DRILLS FLUTED-FEED ROLL COOL SEASON/GRAIN SEED BOX

TYPE OF BOX	TYPE OF SEED	EXPOSED FLUTE	BULK SEED LB'S/ACRE
COOL SEASON/GRAIN BOX Original equipment sprockets with gates in full up position. Exposed fluted feed roll measured on inside of cup.	PUBESCENT WHEATGRASS P-97.5%, G-86%, PLS-84%	1-7/8"	28.4
		1"	16.4
		1/2"	8.95
		1/4"	3.28
	BUTTE SIDEOATS GRAMA P-90%, G-73%, PLS-65.5%	1-7/8"	6.5
		1"	3.4
		1/2"	1.5
	LODORM OATS	1-7/8"	38.0
		1"	21.0
		1/2"	11.4
		1/4"	4.8
	WHEAT	1-7/8"	276.5
		1"	161.9
		1/2"	78.3
		1/4"	42.5
	SOYBEANS Move all cup levers to the middle notch setting for medium to small soybeans. Use the lowest notch setting for large soybeans.	1-7/8"	460.1
		1"	227.5
		1/2"	99.3
		1/4"	47.1
	SMOOTH BROMEGRASS	1-7/8"	121.6
		1"	71.1
		1/2"	36.1
		1/4"	16.1

OUTPUT REDUCTION KIT:

An **Output Reduction Kit** is available for FLEXII model drills manufactured after mid 1996. This kit slows driven sprockets and reduces the seed output from all seed boxes by 50%. The **Output Reduction Kit** can only be used with the original clutch sprockets. Select the **Output Reduction Kit** part number for your drill from the following table:

OUTPUT REDUCTION KIT PART NUMBER	FLXII DRILL MODEL
71054	All end wheel models except FLXII-822
71056	End wheel drive model FLXII-822
710541	Rear wheel drive models FLXII-812, 816, 818
710561	Rear wheel drive model FLXII-822

Note - Output Reduction Kit is not available for Rear Drive Models FLXII-86 and FLXII-88.



OPERATING THE DRILL

FLUTED FEED ROLLS AND SAW-TOOTHED PICKER WHEELS

Fluted feed rolls and saw-toothed picker wheels meter the seed from the bottom of the seed boxes. The amount of exposed flutes of the cool season/grain and small seed feed rolls controls the amount of seed delivered with each revolution of the seed box shafts. Shift levers on the outside bottoms of these boxes control the amount of exposed flute. A 5/16" wide picker wheel that is controlled by the speed changer meters the large seed box for fluffy, chaffy seed. The faster the RPM of the picker wheel shaft the higher the output of bulk seed. The derailleur is used to change RPM on the FLEXII drills

SEED PASSAGEWAY

Seed passageways for all boxes should be cleaned of cobwebs, etc. at the beginning of the season and checked periodically during use. Both the fluffy box and the cool season grain box use convoluted rubber hoses that are subject to plugging from small stems and chaff getting caught in the convolutions. Care must be taken when planting trashy, fluffy seed to watch for plugging of the seed tubes.

Generally, if plugging occurs when planting fluffy seed, it may be prevented by stepping the RPM of the speed changer down several notches. This will reduce the seeding rate. Before proceeding to drill after a plug, be sure to clean all debris from the seed passageway down to and including the furrow opener.

CAUSES OF PLUGGING

Backing the drill up with the planters down in the working position may cause a plug to occur. **DO NOT BACK THE DRILL UP WHEN THE OPENERS ARE IN THE PLANTING POSITION.** Plugging will also occur when a hose is kinked for a period of time and then straightens (which allows a slug of seed down the seed tube all at once).

Generally, hand collected seed must be cleaned before planting through a double disc drill. A broadcast planter such as the Truax Trillion, Pull Type Broadcast Seeder, or Seed Slinger can plant extremely dirty seed.

Sun and heat will at times collapse seed tubes and thereby cause plugging.

OPERATING SPEED

Operate the drill at a ground speed of 4-5 mph. Some field conditions may allow 5-7 mph ground speed. The field conditions and speed of operations may affect flow of the seed through the drill and seed to soil contact. It is important to re-check seeding rates and seed placement at operating speed. Small, hard seeds flow easily through the small seed box, permitting faster speeds, but do not exceed 6 mph. **Seeds tend to be "tossed" out of the furrow when the drill is operated too fast.** When no-tilling, reduce the ground speed of the drill by 1/3.



OPERATING THE DRILL

DRILL SEEDING CAPACITY

The theoretical field capacity for a drill can be estimated with the following formula:

$$\frac{\text{Drill Width (feet)} \times \text{Speed (mph)}}{8.25} = \text{Acres per Hour}$$

The actual field efficiency or amount of fieldwork accomplished is somewhat less than this theoretical calculated rate due to turns at the end of the fields, time spent filling seed boxes, other down time, etc. Field efficiency may be between 65% and 80%. For estimating purposes use the lower end (65%) for small fields, low quality seed, steep terrain, etc. and the higher end (80%) for larger fields, high quality seed, leveler fields, etc.

THREE-POINT HITCHES

The three-point hitch feature is standard on the FLXII-86, FLXII-88, and FLXII-812 drills. Use Category #3 pins. **DO NOT** move a drill that is larger than the lifting capacity of the tractor.

After attaching the hitch to the tractor, adjust the center link on the tractor until the drill is as level as possible for planting. No-till penetration is controlled in part by adjustment of the center link.

NO-TILL

CONTROL OF PENETRATION:

No-tills on all FLEXII Drills are attached to the main frame of the drill.

Remember to run the no-till blades only deep enough to cut the surface residue and scratch the soil surface.

DO NOT dig a furrow with the no-till blades.

Park the drill on a level site, with the drill wheels on boards equal to the depth desired for the no-till blades to penetrate. Lower the planting units to the ground surface. Check to ensure that all no-till blades are touching the ground surface with a similar contact point and make adjustments as needed.

No-till assemblies must be positioned so that the double disc assembly tracks behind and plants in the newly created seed slot.

24 WAVE CASTER STYLE ADJUSTMENT (24 Wave, 18-1/2" Blade is Standard After 01-01-04):

Loosen the U-bolt nuts on the 1-1/2" **shanks** (part #42201X1) of the torsion knuckles and allow the no-till blades to contact the ground. Retighten the U-bolt nuts. The collars on each shank have a "knob" on them, which fits into a recess in the **torsion knuckle base** (part #42203, 422033, and 422034) that controls the swing of the assembly.

Before tightening the collars, be sure the assemblies **will not** swing in such a way as to contact the main frame structure when in use. Adjustment can be made by rotating the 1-1/2" shank before tightening the U-bolt nuts.

TRASH PLOW ADJUSTMENT: (1/2" x 3" spring steel shanks with cast clamp plates)

The 1/2" x 3" spring **steel shanks** (part #52201X2) can be easily adjusted by loosening up the (4) 5/8" **nuts** (part #N58-FN) on each assembly and move the shanks up or down and left or right to equalize their position. Remember to tighten the nuts in the same sequence on each assembly.



OPERATING THE DRILL

TONGUE ADJUSTMENT:

Install the tongue using the set of holes in the main frame that allows the drill to be in its most level position.

Install the tongue clevis to allow the drill frame to be in a near level position when the drill is attached to the tractor and is in the planting position.

The leveling spring assembly on the tongue is the means to fine-tune the drill's no-till penetration. Adjustment is achieved by turning the upper and lower sets of nuts. When both the upper and lower sets of nuts are turned down, towards the tongue, the front of the drill will raise. This lessens the amount of penetration. When the upper and lower sets of nuts are turned upward toward the drill the front of the drill will lower. This results in greater penetration. See Figure 30-2.

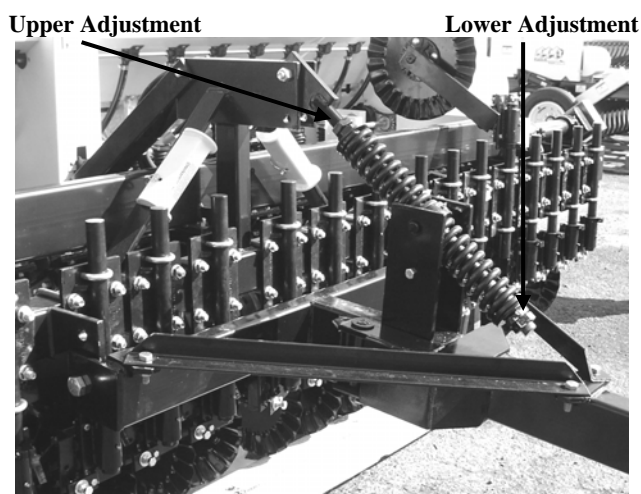


FIGURE 30-2

The leveling spring assembly serves three functions:

- 1) The drill can be leveled so that the no-till coulters, double discs and press wheels are in the same plane. **On some tractors, particularly smaller models, it may be necessary to position the leveling spring in the bottom hole of the clevis on the main frame.**
- 2) Adjusting the leveling spring can control critical penetration of the no-till units. Refer to adjustment procedure.
- 3) The spring assembly controls flexing action of the drill. If the springs are tightly compressed by the adjusting nuts, then there will be less flexing as the unit moves over rough sites and the no-till units (if used) will tend to cut in more. If the springs are loose and the adjusting nuts are tight, then the drill will tend to float over the rough areas. After getting correct penetration, back the top set of nuts off 2 turns, this will allow for more flexing.

REAR DRIVE - TONGUE HYDRAULIC CYLINDER:

Rear Drive drills require a hydraulic cylinder on the tongue in place of the spring leveler assembly to assist in raising the drill for transport. When the transport wheels are lowered for travel on the rear drive drill, the front of the drill tends to "nose" down and contact the ground. Therefore, an additional hydraulic cylinder is installed on the tongue to fold and raise the front of the drill up sufficiently to transport the drill without ground interference. This cylinder is not a rephasing style cylinder and requires a separate hookup with the tractor hydraulics. Cylinder stops on this cylinder are a good idea to help return the drill to the same position each time that you go from transport to the planting position.



OPERATING THE DRILL

ACRE METERS

NON-RESETTABLE, HUB STYLE, ACRE METER:

This acre meter is calibrated and sealed with the sprocket combination on the face of the meter. Field change is not possible. If sprockets are field changed, calculate the ratio between actual area covered and the reading on the counter and use this "**factor**" to determine acreage readings in the future. Changing tire sizes from the standard rib implement tire will affect the acre meter reading.

Using the Output Reduction feature will result in the acre meter reading 1/2 the actual acres planted. When using the Output Reduction feature the acre meter reading times 2 is the actual acres planted.

CAUTION

ACRE METER READING IS REDUCED:

1) WHEN CLUTCH SPROCKET IS NOT 30 TOOTH

*** 2) WHEN OUTPUT REDUCTION FEATURE IS IN USE:**

DIGITAL ACRE METER:

The Danaher acre meter is a "State of the art" meter which is field programmable. Your Truax drill with the digital acre meter option has already been programmed to the specific specifications of your drill. However, should the need arise to reprogram the meter due to changes in seed rates or tires, the following is a guide to help you arrive at the programmed number which is the amount of revolutions the clutch shaft will rotate when planting one acre.

Step 1: Determine the circumference (in feet) of the drive wheel

Measure the diameter (D) of the drive wheel in inches of your drill. Enter this number into the formula for the circumference (C) $C = (3.14 \times D) / 12$

Example: for a 29" wheel diameter

$C = (3.14 \times 29) / 12$ which equals 7.588 ft



OPERATING THE DRILL

Step 2: Determine the distance (in feet) your drill needs to travel to plant one acre

To determine this distance look at the table below

Drill Model	Planting width	Distance drill needs to travel to plant one acre
FLXII -86	4.0 FT	10,890 FT
FLXII -88	5.3 FT	8,218.868 FT
FLXII -812	8.0 FT	5,445 FT
FLXII-816	10.7 FT	4,071.028 FT
FLXII-818	12.0 FT	3,630 FT
FLXII-822	14.7 FT	2,963.265 FT
OTG-7508	5.0 FT	8,712 FT
OTG-7512	7.5 FT	5,808 FT
OTG-7516	10.0 FT	4,356 FT
OTG-7518	11.25 FT	3,872 FT
OTG-7522	13.75 FT	3,168 FT
TR-96	8.0 FT	5,445 FT
TR-120	10.0 FT	4,356 FT
TR-144	12.0 FT	3,630 FT

Note: The distance drill needs to travel to plant one acre is determined by taking the square feet in one acre (43,560 sq ft) and dividing it by the planting width.

Example: For FLXII -88 model

Distance to cover one acre = 43,560 sq ft divided by 5.3 feet

Which equals 8,218.868 feet

Step 3: Determine the number of revolutions the drive wheel will rotate when planting one acre.

To determine this number, take the distance drill needs to travel to cover one acre from the table above and divide it by the circumference (C) of the drive wheel (determined from step 1)

Example: For FLXII -88 model (with 29" drive wheel)

The number of drive wheel revolutions in one acre= 8,218.868 feet divided by the circumference 7.588 feet which equals 1,083.14 revolutions



OPERATING THE DRILL

Step 4: Determine the number of revolutions the clutch shaft will rotate when planting one acre.

From the table below determine the decimal fraction number of your drill. Take this number and multiply it by the number of revolutions the drive wheel rotates when planting one acre (determined from step 3).

Drill Model	Decimal fraction number	Sprockets that determine decimal fraction number
FLXII MODELS	0.52	26 tooth sprocket at drive wheel drives 30 tooth sprocket located on the outside of the leg shaft- on same leg shaft there is an 18 tooth sprocket located towards the inside of drill driving a 30 tooth sprocket on clutch $26/30 \times 18/30 = 0.52$
OTG MODELS	0.33333333	26 tooth sprocket at drive wheel drives another 26 tooth sprocket located just above it on the drive shaft- on the other end of the drive shaft is a 18 tooth sprocket driving a 54 tooth sprocket located on the clutch $26/26 \times 18/54 = 0.33333333$
TRILLION MODELS	0.5	15 tooth sprocket located at the roller drives a 30 tooth sprocket located towards the front of the drill -on same shaft as 30 tooth sprocket is an 18 tooth sprocket driving another 18 tooth sprocket located at the clutch $15/30 \times 18/18 = 0.5$

Example: For FLXII -88 model

Number of revolutions the clutch shaft will rotate when planting one acre= $0.52(\text{from table above}) \times 1,083.14$ (number of drive wheel revolutions from step 3) which equals 563.23

The number of revolutions of the clutch shaft per one acre of planting is the number to program into the digital acre meter (rounded to the nearest tenth which is 563.2)

If the **Output Reduction Kit** was taken as an option for your drill then reduce the number of revolutions of the clutch shaft per one acre of planting by half. To determine if your drill was equipped with an output reduction kit, **one** of the following equipment configurations would have been installed:

Configuration #1- There would be a larger sprocket, either a 54 or 60 tooth, replacing the OEM(Original Equipment Manufacturer) 30 tooth sprocket on the clutch.

Configuration #2- There would be a jackshaft installed in front of the clutch shaft that has a double 18/36 tooth sprocket which is driven by a double 18 tooth sprocket on the leg shaft. Note: If the double 18 tooth sprocket on the leg shaft is driving the 36 tooth sprocket the drill is seeding at half the rate, hence output reduction, but if the double 18 sprocket on the leg shaft is driving the 18 tooth sprocket the drill is seeding at the standard rate (no output reduction).

Example : For FLXII -88 model

Take the number 563.23 and reduce by half which equals 281.62 (to the nearest tenth 281.6)

Follow the instructions from the Danaher digital acre meter info sheet to program meter



MAINTENANCE & SERVICE

PROPER MAINTENANCE & SERVICE

Proper maintenance and service of the drill will save time and increase the life of the drill.

Drill Model FLXII-822 is driven from both ends of the machine. In this manual the term "Non-Typical" references the left side of the drill when viewed from the back.

SEED BOXES AND LID HINGES

Check seed box lid hinges frequently for accumulation of dirt and debris. Clean as needed and apply an LPS silicone lubricant, WD-40, or any equivalent lubricant to the hinges to keep them operating freely. Replacement brass hinge pins (part #1038HP) and two 1/16" x 1/2" cotter pins (part #CP116-.5) are available.

The box integrity including welds and bolted assemblies must be inspected and maintained. All seed, debris (such as seed sacks), and unused material must be removed before transport and storage.

DO NOT use any Truax equipment with the lids of the seed boxes open.

LARGE (FLUFFY) SEED BOX

Problems caused by shaft interference between the **picker wheel shaft** (part #2003) and the **transitions** (part #1033) can be repaired by loosening **bolts** (part #B38-.750) that hold the box to the end plates and slightly rotate the box. The bearings holding the picker wheel shaft can also be loosened and the shaft can be moved slightly. The center bearing of the picker wheel shaft is held to the fluffy box bottom by a **bearing support bracket** (part #10316) that can be loosened and moved for increased shaft clearance. Also, each transition can be moved in either direction.

When removing or adjusting the **picker wheels**, (part #2002) remove the set screws entirely, as they tend to screw themselves in and tighten up again during shaft removal. Use a plastic or lead hammer when removing the shafts from the drill so the shaft ends do not become marred.

SMALL (LEGUME) SEED BOX

Irregular seeding rates can be corrected by adjusting the individual cups. After loosening the cup mounting bolts it is possible to move each cup about 1/8" and thereby change the cup output in relation to the others. If a plastic seed cup is broken, a field repair can be made with "**super glue**" (if all the parts can be found). All plastic seed tubes **should** be removed annually and cleaned thoroughly.

If the seed cup shaft tends to "walk" left or right when in use, the cause is usually wear of the shifter spool. This problem can be corrected by installing a thin **spacer** (part #MB 12-.15 or JD #N160437) over the 3/8" shaft between the roll pins and the shifter spool.

COOL SEASON SEED BOX

On a daily basis when planting dense seed that tends to settle and compact, before starting to drill it is a good idea to turn the feed shaft with a wrench in the direction it normally turns. If it turns hard, remove the drive chain to the box and apply a dry silicone based lubricant to each cup while turning feed shaft with a wrench.

When moving the shifter to a new position when the box is filled with seed, it may be necessary to turn the feed shaft with a 5/8" wrench while moving the lever.



MAINTENANCE & SERVICE

COOL SEASON SEED BOX (Con't)

If the feed shaft continues to "walk" after checking the above items, then check each seed cup. Loosen the two retaining bolts on each cup and tap (lightly) with a plastic hammer to check the alignment. Retighten and proceed to the next one.

Check the **shifter bearing** (part #M60862) for excess endplay. When excessive endplay is present, install a new **thrust washer kit** (part #TM60820) on drills manufactured between 1975 and mid 1998. Drills manufactured after mid 1998 have a Delrin® **thrust washer** (part #TM60826) and **shifter bearing** (part #M608621). This helps prevent the 5/8" shaft (part #3103) from "walking". On drills manufactured after mid 1998 replace worn parts as needed. See Figure 40-1 for an illustration of the assembly.

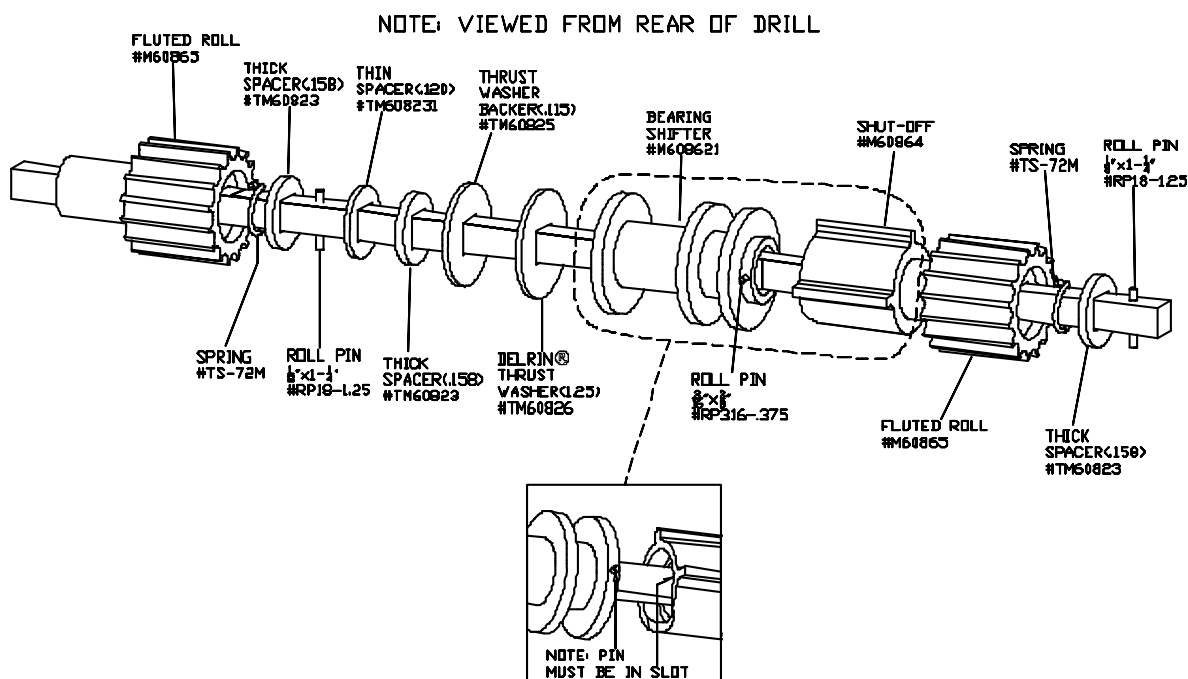


FIGURE 40-1

Drills manufactured after February 1994 have a heavy-duty **shifter** (part #3205). When installing this shifter on older drills it is necessary to move the **shifter quad** (part #3229) on the seed box.

COOL SEASON FLUTED FEED CUPS

The feed gate latch on the right side of the cool season cup serves as an adjustment for seed size and as a means to clean out the cup. The setting may need to be changed when drilling larger seeds (such as soybeans) to prevent them from crushing. Fluted Roll (After Serial# 2925 use part # 731865) Shut-off (After serial # 2925 use part # 731864). A repair kit (AN161511) is available to repair broken latch or gate.



MAINTENANCE & SERVICE

SERVICING THE COOL SEASON FLUTED FEED CUPS

It may be necessary to service the feed cups whenever the shaft becomes difficult to shift, the rolling torque is too high, or when one or more of the cups have been removed. See Figure 40-2 for diagram of part identified below.

- 1) Open the **feed gate levers**.
- 2) Start at the end of the drill near the shifter lever and loosen the bolts holding the **seed cups** to the bottom of the box.
- 3) Move the **seed cup** until the end of the **fluted feed roll** is flush with the inside surface of the seed retainer ring on the lower radius of the seed reservoir.
- 4) Reset all the **seed cups** in the same manner (beginning with the cups next to the shifter) working alternately in both directions.
- 5) Tighten the bolts on each **seed cup** as soon as resetting is complete.

Note: The cup retaining bolts require a **washer** (part #W14) between the bolt head and the seed cup.

- 6) Recheck the adjustment by moving the feed shaft shifter back and forth. Recheck all **fluted feed rolls** to insure that they are flush at the lower radius of each seed cup. (After Serial#2925 use part # 731865). Shut-off (After Serial#2925 use part # 731864). Seed cup (After Serial#2925 use part # 731003A).
- 7) Close the **feed gates** to the desired setting, making sure that all gates are in identical positions.

Note: During installation, if the cup retaining bolts pull through the plastic cup, it will be necessary to place a **washer** (part #W14) on the bolt before installation.

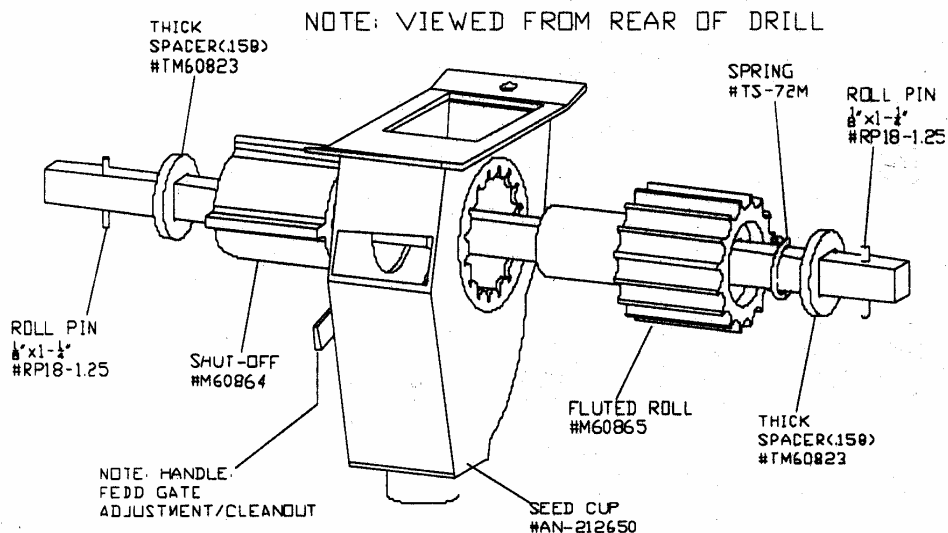


Figure 40-2



MAINTENANCE & SERVICE

SERVICING THE SCRAPERS

Disc openers utilize three sets of scrapers on the disc blades and depth bands to prevent a buildup of soil that will affect disc operation and proper seed placement. For effective operation of the scrapers inspect frequently and adjust or repair as needed.

- The **inside scraper assembly** (part #AM11828) is a kit attached to the **boot (shoe) casting** (part #0888 - black) with a square headed full thread 1/4" x 2" **bolt** (part #B14-2sq.h) and self-locking **nut** (part #N14-FNL). Scrapers have a **right-hand** (part #50919A) and a **left-hand** (part #50919B) designation and are joined by a **clip** (part #50919D). Place the bolt through the boot casting. Place the clip, with scrapers attached, on the bolt; followed by a **concave plastic wedge** (part #JDN213158); followed by a "U" shaped flat **metal spring** (part #JDN213159); followed by a **convex plastic wedge** (part #JDN213160); followed by the self-locking nut. Tighten the nut leaving one thread exposed. **See Page 90-20, Item #58 for a diagram.**

Inside scrapers must be positioned prior to installing the disc blades.

- The **outside scraper assembly** is attached to the boot (shoe) casting. There is a groove in the casting where the upper flange of the scraper sits. When facing the drill from the back, the 5/16" x 4 1/2" carriage **bolt** (part #CB516-4.5) is inserted through the **right side scraper**; through the **boot (shoe) casting** (part #0888 - black); through the **left side scraper**; through a 5/16" flat **washer** (part #W516); and through a **compression spring** (part #50919). A 5/16" flanged self-locking **nut** (part #N516-FNL) holds the assembly in place. Adjust the tension so the scrapers clean the disc blades (usually tighten so that one thread is exposed).

The depth bands, outside scraper assembly, right-hand scrapers, and left-hand scrapers each have a unique part number. Refer to the chart below to determine the correct part numbers.

DEPTH BAND SIZE AND (PART #)	EXPOSED BLADE EDGE	PLANTING DEPTH	SCRAPER ASSEMBLY #	RIGHT-HAND SCRAPER #	LEFT-HAND SCRAPER #
9 1/2" (#1097F)*	2"	1"	10845FA	10845F-RH	10845F-LH
10 1/2" (#1097D)	1 1/2"	3/4"	10845DA	10845D-RH	10845D-LH
11 1/2" (#1097)*	1"	1/2"	10845A	10845	10845
12" (#1097C)*	3/4"	3/8"	10845CA	10845C-RH	10845C-LH
12 1/2" (#1097A)*	1/2"	1/4"	10845BA	10845B-RH	10845B-LH

* With bearing case (part # M1677685) and bearing (part #JD85205) or bearing and case (part #AM1128675) depth band requires a center hole diameter of 3-3/4".

IMPORTANT: The ability of the double disc blades to penetrate is affected by mud build-up on the blades.
Keep outside scrapers in good working condition.

- The **depth band scraper assembly** (part #10995A) is attached to the **boot (shoe) casting** (part #0888 - black) with a 1/2" x 3" **bolt with welded collar** (part #1201); and a self-locking **nut** (part #N12-CL). **Scrapers** (part #10995 & part #109953) are attached to the assembly with 5/16" x 1-1/4" **bolts** (part #B516-1.25), 5/16" **washers** (part #W516), and self-locking flanged **nuts** (part #516-FNL). After 2/02 standard equipment is the **plastic scraper** (part #10995) with a **hardened metal scraper** (part #109953) as a backing to stiffen the depth band scraper. The scraper blades can be adjusted to the depth band as the scrapers wear. Scraper blades should touch the depth band without applying pressure that will prevent the disc blade from turning. Depth band scrapers should be checked regularly and adjusted or replaced as needed.

IMPORTANT: Bent depth bands affect scraper effectiveness and life. Straighten or replace any bent depth bands.



MAINTENANCE & SERVICE

SERVICING THE DISC BLADES

It is necessary to remove disc blades to perform several maintenance functions as well as replacing and greasing bearings in the double disc blades. Use the following procedure for removing or re-assembling disc blades:

- 1) Remove the outside scrapers by loosening the nut on the 5/16"x 4-1/2" carriage bolt. Remove the compression spring and flat washer. Badly worn scrapers need to be replaced. There are right and left side scrapers for all depth bands except for scrapers on 11-1/2" depth bands. The left and right side scrapers on the 11-1/2" depth band are interchangeable. The slant edge, or cut side, is placed on the depth band face. When reassembling the outside scraper, tighten the 5/16" flanged self locking nut until one thread is exposed.
- 2) Remove the depth band scrapers by loosening the 5/16" nuts on each scraper. Replace scrapers if existing pieces are badly worn.
- 3) Remove the disc blades. When facing the drill from the backside, the **right-hand disc blade 5/8" bolt** (part #K300M) has right-hand threads and the **left-hand disc blade 5/8" bolt** (part #K301M) has left-hand threads. Remove the **dust cap** (part #3095 or #4095) and **spacer** (part #1100 or JD#M15226). **These part numbers are for disc blade assemblies 1998 or later. For part numbers before 1998, see Table on Page 40-6.**
- 4) Replacing the **blade** (part #K202M or #K202M5).
 - **Blade Part #K202M has a rivet hole spacing of 2-1/2". Blade Part #K202M5 has a rivet hole spacing of 3-1/8".**
 - Remove rivets by grinding off heads on the backside of the blade.
 - The case can be reused if the bearing fits tightly into it. Clean the case and press in a new bearing.
 - Re-rivet the blade, using a press to set all six rivets at once, if possible.
- 5) When reassembling use Loctite on the disc blade bolt threads. Wipe the threads clean of all grease or oil, as Loctite **will not** adhere properly when grease is present. Place the **5/8" bolt** (part #K300M and K301M) through the **dust cap** (part #3095 or #4095), through the **disc blade** (part #K202M or #K202M5), through the **spacer** (part #1100 or JD#M15226), into the threaded **boot (shoe) casting** (part #0888-Black). Torque the 5/8" bolts to 125 foot pounds.
- 6) After installing the blades, the tips of disc blades should uniformly touch as the blades are rotated. Add or remove **spacers** (part #1100) as necessary. You should be able to slip two sheets of paper (20-pound weight) between the blades. Any wider gap than that is too much and you need to remove **spacers** (part #1100).
- 7) Reassemble the inside and outside disc blade scrapers. When installing **inside scraper assembly** (part #AM11828), they must be positioned prior to installing disc blades.
- 8) Reassemble the depth band scrapers.



CAUTION: DO NOT hold edge of disc blade with your hand as serious injury may result! It is a good idea to hold onto the blade with a vice grip or similar tool and wear gloves.

IMPORTANT: Disc blades should just make contact at the closest point. Add or remove **spacers** (part #1100 or JD#M15226) as needed.



MAINTENANCE & SERVICE

SERVICING THE DISC BLADES (Con't)

NOTE: The **blade, case, and bearing assembly** and individual components are listed below with associated part numbers. These assemblies do not include the depth band.

The correct assembly is determined by the method the dust cap is attached to the disc blade. Disc assemblies marketed before 1998 have a force style dust cap. On assemblies marketed in 1998 and later the dust cap is held in place by the RH or LH threaded bolt passing through the dust cap.

ITEM	BEFORE 1998	1998 TO 6/30/2006	07/01/2006 OR LATER
Assembly-Blade, Case, Bearing	KK-254M5	KK-254M53	KK-254M55
Boot Seal	M17520	None	None
Spacer	1100	1100	1100
Blade	K202M	K202M	K202M5
Bearing	JD8573	JD85204*	JD85205
Spacer	JD8573A	None	None
Case	M167768	M1677683	M1677685
Rivets	16H630 (1/4" x 7/16")	16H630 (1/4" x 7/16")	16H630 (1/4" x 7/16")
Bolt – RH Thread	K200M**	K300M**	K300M**
Bolt – LH Thread	K201M**	K301M**	K301M**
Dust Cap	2095**	3095**	4095**

* Truax Part #JD85204 is the same as John Deere Part #AA21480

** Part required but not included with assembly KK-254M5, KK254M53 or KK254M55

NOTE: The **blade, depth band, case and bearing** are available as an assembly. This assembly does not include the **bolt** (part #K300M or K301M) or the **dust cap** (part #3095 or #4095). See table below for part # when ordering unit assembly including depth band:

DEPTH BAND SIZE*	PART # FOR (BLADE, DEPTH BAND, CASE, AND BEARING)
11 1/2" – Before 10/98	12545
11 1/2" – After 10/98	125453
12" – Before 10/98	12545C
12" – After 10/98	12545C3
12 1/2"	12545A3

* All depth bands for bearing cases after 07/01/2006 require a center hole of 3-3/4" Diameter.

IMPORTANT: Warping of disc blades may be caused by mud being forced behind the depth bands. This may be prevented by proper scraper alignment. On production after spring of 1996, scraper assembly will clean both the blades and the horizontal depth bands.

NOTE: Production after the spring of 1993 has a **locking spring washer** (part #W38LS) pressed onto the **depth band retaining bolts** (part #B38-.75) which prevents the bolts from dropping out of place when the depth band is removed.

NOTE: Production after midsummer of 1993 uses an **"E-Z" OFF Depth Band** (part #1097, #1097A, #1097C, or #1097F) that is keyed to be placed over the loosened **depth band retaining bolts** (part #B38-.75) and turned into position before tightening the bolts. This allows easier replacement of depth bands.



MAINTENANCE & SERVICE

SPEED CHANGER AND CLUTCH ASSEMBLY

The derailleur style speed changer only provides power to the large, fluffy box. Power is passed through it, via the input shaft, to the small box; however, no reduction in speed or output is achieved. The clutch controls the "go" or "no-go" function for all the boxes on the drill.

The roller clutch assembly can be serviced by loosening the set screw in the **shaft collar** (part #1124) and sliding the clutch hub to the right. If the **bronze bushing** (part #1121) is worn, remove the hub from the shaft and replace the bushing.

When installing a new clutch assembly (after the shaft collar has been aligned and tightened), be sure that the clutch will free wheel when the dog lever is held down. If it catches and will not free wheel, loosen the shaft collar, slide it to the right, and check for interference. Several things may have occurred:

- 1) A bushing may be installed on the 1" shaft between the two halves of the clutch. A different thickness may be tried, such as .050", .030" to provide clearance between the "**bosses**" on the clutch housing and the dog lever.
- 2) The three "**bosses**" in the hub may be interfering with the dog roller. Slight grinding may be required on the face of the three "**bosses**". If problems persist, apply a small amount of paint or chalk to the inside of the clutch assembly to determine from the wear pattern where the interference is occurring.
- 3) If any shaft shifts, it can be retained by removing a set screw from each shaft bearing, drilling a 1/8" detent (using the set screw hole as a guide), and reinstalling the set screws. Apply blue or green color Loctite to the set screws.
- 4) If either speed changer **shaft bearing bracket** (part #103626) bends or breaks, it may be caused by overloading of seed boxes. Some seed will need to be removed from the seed boxes. Also, debris left in the boxes will cause problems. Additional torque created by dense, heavy seed may be reduced by increasing the size of the driven sprockets on the box ends.

Drills manufactured after 1996 have an additional **bearing support** (part #10316) to the right of the clutch when facing the drill. This prevents bending part #103626. This bearing support will retrofit drills manufactured after 1988. See **Figure 40-3**.

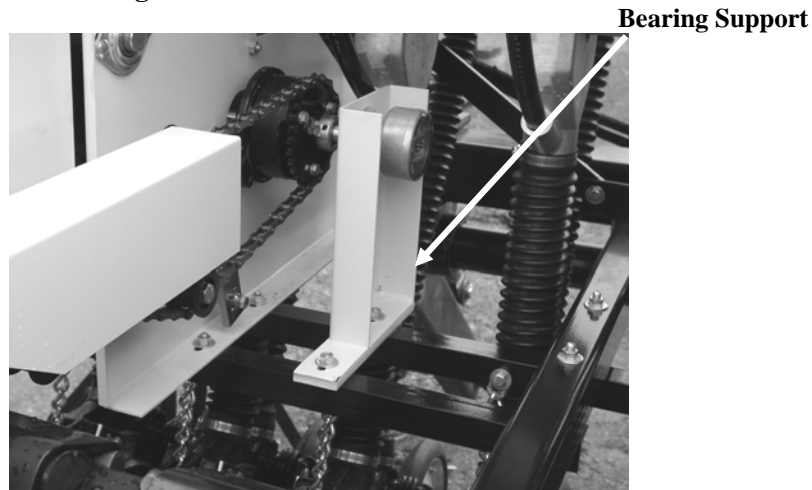


FIGURE 40-3



MAINTENANCE & SERVICE

CLUTCH SPROCKET

Large adjustments in seeding rates can be achieved by changing the size of the clutch sprocket. This **affects the seeding rate from all** of the seed boxes. The larger the sprocket on the clutch, the lower the seed rate. The smaller the sprocket on the clutch, the higher the seeding rate. See table below for alternative sprockets and associated part number.

SPROCKET SIZE	PART NUMBER
30 Tooth (Standard)	1044
48 Tooth	1144E
54 Tooth**	1144A
60 Tooth**	1144B

When the Output Reduction Kit is installed, the 54 and 60 tooth sprockets will not fit.

CLUTCH TRIPPER

The **clutch tripper assembly** (part #1118) is attached to and moved by the **drive leg** (part #1037LDX). The tripper assembly serves to disengage the clutch when turning within the field or during transport. When the drive leg is lowered the clutch tripper rod assembly will move the clutch trip engager into contact with the clutch dog causing the clutch to disengage. **To avoid excessive wear in the clutch hub (part #1120), always lower the wheels (raise the drill) to the fullest extent possible when turning within the field or when transporting the drill.**

Before adjusting the tripper, it is important to check the rephasing cylinder to insure that it is moving freely in the **sliding float mount** (part #1037FEX). Also, check the spring in the **clutch tripper rod assembly** (part #1118X) to insure that it is compressing. The spring in the rod assembly acts as a safety, in case the engager is misaligned and contacts the clutch dog at the wrong point.

The length of the rod assembly from center to center of yoke ends measures 26 inches. With the drive leg hydraulic cylinder retracted and all free travel of the float removed (full up), the clutch tripper rod should be mounted to the **clutch tripper collar** (part #1037CLX1 – all models except FLXII-822). Rotate the tripper collar clockwise, from the drive end of the drill, and tighten the collar bolt. At this point the **clutch trip engager** (part #1119BBX) should be away from the clutch dog.

With the drive leg hydraulic cylinder extended, the **clutch trip engager** (part #1118BBX) should be within 1/16" to 1/8" of the **clutch housing with dog trip** (part #1119). The two pieces should not touch to avoid wear of the housing, but must be close enough to fully engage the dog trip.

In the event that the clutch tripper will not rotate enough before contacting the **bearing mount** (part #1037BHX), it will be necessary to grind off the interference.



MAINTENANCE & SERVICE

CLUTCH TRIPPER (Con't)

On end wheel drive drills the **clutch tripper rod assembly** (part #1118X) attaches to the drive leg at the front of the drill and near the top of the **clutch trip engager** (part #1118BBX). The pivot point for the clutch trip engager is on the bottom. See **Figure 40-4**.

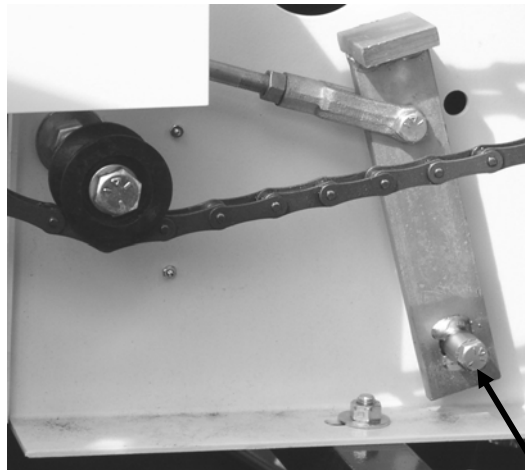
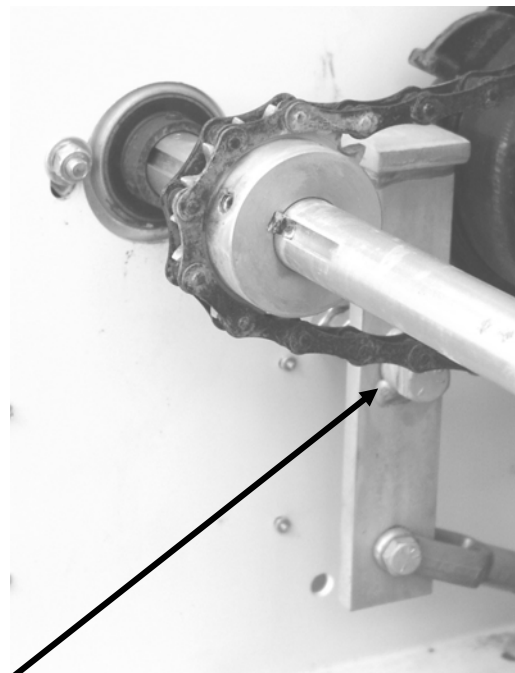


FIGURE 40-4

Pivot Point

On rear drive drills the **clutch tripper rod assembly** (part #1118X) attaches to the drive leg at the back of the drill and to the bottom of the **clutch trip engager** (part #1118BBX1). The pivot point for the clutch trip engager is in the center. See **Figure 40-5**.



Pivot Point

FIGURE 40-5



MAINTENANCE & SERVICE

IDLER ASSEMBLIES

NOTE: See "Idler Assemblies" located in the parts catalog for additional information.

The idler assemblies put tension on the chains to prevent them from "walking" off the sprockets. All idlers, using plastic rolls, are installed on the slack side of the chain. The following procedure should be followed when servicing idlers:

- 1) Before servicing chain idlers, be sure that the sprockets are in alignment and that the chain runs freely.
- 2) Raise the drive wheel from the ground and block the other drill wheel and tongue.
- 3) Start with the end wheel chain and check to see whether the chain is installed per decal. The bottom of the chain is the tight, non-slack, side and it must be installed as per the decal. The two idlers provide chain tension and control interference with the leg and float mount bolts. Without proper adjustment, the chains may walk off the sprockets and/or cause the sprocket shear pins to break. Ensure that the 1/4" chain guard bolts do not interfere with end wheel chain.
- 4) The chain from the sprocket on the rock shaft to the clutch requires two idlers to maintain proper tension. These two idlers must be installed at the same time as the chain guard in order to get proper tension on the chain. See **Idler Decal** (part #1046C10), mounted on **clutch support** (part #103625) for proper positioning of these idlers.
- 5) The idler for the fluffy seed box agitator and picker wheel **must be positioned on the slack side in such a way as to allow the 3/8" bolt holding the derailleur idler assembly** (part #15-7116A) **to be installed in the end plate** (part #103625) and still allow clearance for the chain. See **Figure 40-6** for chain and idler orientation.

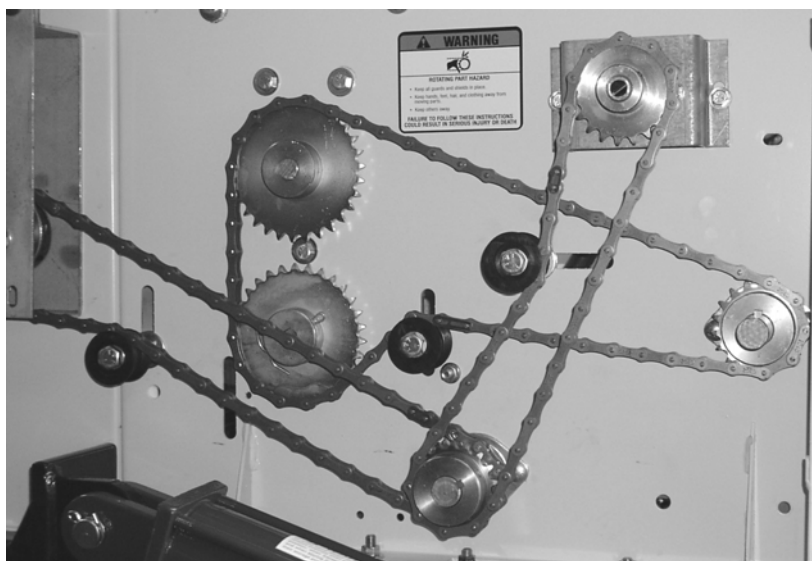


FIGURE 40-6

- 6) The two **idler brackets** (part #3237X) on the leg tend to bend when under heavy load; therefore an additional support has been added and can be used to retrofit drills manufactured after 1988.



MAINTENANCE & SERVICE

MAIN FRAME

IMPORTANT: Clean drain holes in the main frame at least annually. Any water in the frame tubes may cause bulges to occur if it freezes. Drain holes are located on the bottom corners of the main frame and the bottom of all cross members.

- 1) The main frame has few moving parts; therefore it requires little maintenance.
- 2) The **flex torsion knuckles** are not meant to be field serviced; however, they can be adjusted to retain equal torsion forces and change alignment.
- 3) Down pressure on the torsion knuckles can be adjusted on the planters by loosening the four 1/2" **bolts** (part #B12-1.5) that hold the **lift bracket support** (part #10321) to the **knuckle casting** (part #10323). Loosen **jam nut** (Part #JN12) on **jack bolt** (part #JB12-2) and turn bolt to force part #10321 down. Place the lift bracket tight against the jack bolt. Retighten jam nuts and four bolts (part #B12-1.5). Use two 3/4" open-end wrenches.
- 4) Alignment can be changed by loosening the four **bolts** (part #B38-1.25) that hold the **clamp half** (part #10322) to the **knuckle casting** (part #103211). If possible, do not remove the nuts completely before again attempting to move the knuckle left or right. If nuts are completely removed or when installing new **rubber cords** (part #42202X) it may be necessary to use a large "C" clamp to bring the parts together. Install back bolts first, pull the front together with "C" clamp and install front ones. A threaded rod 3/8" diameter or smaller may be used to pull it together and then change to the standard bolts. Be sure the **rubber cords** (part #42202X) are centered on the four sides of the rock shaft as the **clamp half** (part #10322) and the **knuckle casting** (part #103211) are drawn together.

NOTE: Drill production prior to spring of 2002 used a **planter support chain** (part #8955XA) that may become tangled in use. Production in 2002 and later uses a twisted link **planter support chain** (part #8955XA). This new chain will retrofit drill models back to 1988.

- 5) Refer to the "**Clutch Tripper Section**" for information on the adjustment of the clutch tripper assembly.
- 6) Drill main frames require two rephasing cylinders to raise and lower the drill from planting to transport position. Rear drive drills require a third cylinder on the tongue. A standard 2-1/2" x 8" cylinder is mounted from the tongue to the top of the three-point mount of the drill. Separate hydraulic connections are made to the tractor hydraulics.
- 7) The drill can be converted to a three-point style from a tongue-style by removing the tongue and installing Category #3 pins. **DO NOT** use the drill in three-point mode unless the tractor is large enough to handle the weight of the drill. See Specifications Section (pages 80-1 through 80-3) for weight of the drill **without seed**. Check your tractor owner's manual for weight capacity of three-point hitch.
- 8) The **float guide** (part #1037FEX) for the drive end rephasing cylinder may be aligned by several **shims** (part #1037FEX1). Anytime the float guide is serviced; the shims may have to be positioned so that the cylinder end will slide up and down the float guide. Drills manufactured after 1999 have a welded style leg and float guide; therefore no adjustment is necessary. After making any adjustments to the **float guide** (part #1037FEX), be sure that the **clutch trip engager** (part #1118BBX) is within 1/16" to 1/8" of the **clutch housing with dog trip** (part #1119). The two pieces should not touch to avoid wear of the housing, but must be close enough to fully engage the dog trip.



MAINTENANCE & SERVICE

LUBRICATION SCHEDULE & RECOMMENDED LUBRICANTS

Moving parts and bearings on all drills require regular lubrication. For optimum life of the drill it is recommended that synthetic **grease** (such as Kerr-McGee Mystik JT-Truax part #9991) be used every 4 hours on all the zirks.

At points requiring lubrication that do not have a grease zirk, it is recommended that a light lubricant, such as LPS Silicone lubricant be applied on a daily basis.

Sliding surfaces, such as the idler in the speed changer, should have a silicone-based lubricant applied frequently.

LUBRICATION TYPE - QUICK CHECK	
PARTS REQUIRING LUBRICATION	TYPE OF LUBRICATION
All Chains	LPS Silicone Lubricant
Feed Rolls	LPS Silicone Lubricant
Press Wheel Bearings	LPS Silicone Lubricant
Idler Bushings	LPS Silicone Lubricant
Clutch Zirk	Synthetic Grease
FLEX Bearing Mount Zirks	Synthetic Grease
Spring Leveler Zirk	Synthetic Grease
No-Till Hub Zirks	Synthetic Grease
No-Till Swivel Mount Zirks	Synthetic Grease
Leading Press Wheel Hub Zirks	Synthetic Grease
Box Hinges	LPS Silicone Lubricant
Bronze Bushings	LPS Silicone Lubricant
Double Disc Seals	Synthetic Grease

REMEMBER: The first rule of good lubrication and maintenance is **common sense!**
Keep it clean and keep it oiled!

It is recommended that lubrication be done immediately after drill usage (while the surfaces are still warm). This will allow the grease to cover the bare metal parts before cooling and condensation has begun to form.

Axles are retained to main frame by 3/8" x 3" bolts and nuts. Check daily to be sure that they are in place and tight.

Check wheel lug nuts periodically to ensure they are tight. Lug nut torque should be 75 to 85 foot lbs each.



MAINTENANCE & SERVICE

LUBRICATION SCHEDULE:

ITEM	SCHEDULE
Chains	Apply LPS Silicone Lubricant, WD-40, or equivalent. At the end of the season, remove the chains and soak them in light oil for storage purposes.
Seed Boxes (all styles)	Check frequently and clean as needed. Apply LPS Silicone Lubricant, WD-40, or an equivalent lubricant to the hinges.
Speed Changer	The derailleur style of speed changer for the fluffy box requires lubrication maintenance. LPS Silicone should be applied to the idler bushing that retains tension on the chain between the two cone sprockets once a day. Also, LPS Silicone should be applied to the derailleur chain and clutch tripper rod pivot points on a daily basis.
Clutch	Grease daily with synthetic grease such as JT-6 synthetic grease (part #9991).
Idlers	All idlers have a steel bushing that should be lubricated weekly with a silicone lubricant.
Furrow Openers	<p>On drills built before mid 1998, the double disc bearings (part #JD-8573) are sealed; however seals (part #M-17520) should be serviced on a regular basis. After removing the disc blades, take the seals from the boot (part #0999-yellow or #0888-black) and clean and check for wear. It is recommended seals be replaced when servicing the bearings.</p> <p>Place clean seal (cup edge down on a clean surface) and inspect the contact surface of the lip. If the lip contacts the surface uniformly, the seal may be reused. With the cup edge up slip it onto the boot casting and fill the lip of the seal with JT-6 synthetic grease (part #9991). Continue to reinstall the double discs.</p> <p>After mid 1998, disc bearings (part #JD-85204) do not use a seal (part #M-17520).</p>
Press Wheel Bearings	Press wheels do not have a zirk in the press wheel bearing (part #1092A1). These should have a silicone lubricant applied several times per day for optimum life of the bearing. The bearing (part #1092A1) has been hardened to Rockwell-40 and will have slight wearing if the lubricant is not applied. There will be more wearing on the axle bolt (part #B12-4) if it a silicone lubricant is not applied several times per day.
Wheel Bearings	The wheel bearings on all drills use a tapered roller bearing. When servicing these bearings, clean, check for wear, and use synthetic grease, such as JT-6 (Truax part #9991) or equivalent. Check seals for leaking.
Main Frames	The main frames on all drills have zirk fittings on the four bearing mounts (part #1037BHX). They should be greased several times a day.
Lockout Hub	Grease daily with synthetic grease such as JT-6 synthetic grease (part #9991).
Spring Leveler Assembly Pivot	The spring leveler assembly pivot (part #4027 and #G024-5116) on the tongue of all drills has a zirk that requires daily service.
No-Till	The no-till hubs have a zirk on the back that should be greased daily. Do not over grease as it may cause the seals to be forced out of position. Swivel mounts on the dura-flute knuckle bases have a zirk that should be greased twice a day.



MAINTENANCE & SERVICE

THREE-POINT HITCHES

The **lift pins** (part #2051) should be checked for metal fatigue and looseness before each use. Replace the pins if they show any indication of bending.

SPRING LEVELER

The two sets of double nuts on the spring leveler must be free to tighten against the two springs. Movement of the nuts in one direction will move the front of the drill in the opposite direction. **That is, if both sets of nuts are moved downward then the front of the drill will move upward.**

A bent **spring rod** (part #4217B1) or broken **springs** (part #4217A) must be replaced because they will affect the penetrating force of the drill.

HYDRAULIC CYLINDERS

The hydraulic cylinders on all drill end drive and rear drive wheels are the rephasing type. The cylinder on the drive side (next to the speed changer) is (3-1/4") and the cylinder on the non-drive side (3-1/2"). It is important that any time the cylinders are removed or the hoses disconnected, that the proper procedure be followed when reconnecting them. **After reconnecting the hoses, bleed the air from the system by cycling the system through the tractor hydraulics several times. Do not try to bleed air from the system by loosening fittings.**

The objective is to get both cylinders fully retracted. When cylinders stay in a fully retracted position it will mean there is no air or leaks in the system.

- 1) First, secure the drill tongue to tractor drawbar and block the wheels (both front and back).
- 2) After hooking up the hydraulic system, cycle the system so that the wheels of the drill raise and lower until they go up or down together. If this does not happen, it may be caused by either an air bubble in the system, low hydraulic fluid in the system, poor hydraulic connection, or incompatible hydraulic connectors.
- 3) After checking the hydraulic fluid level, continue to cycle the system. If after a period of time the system does not level out, there may be a problem with the cylinders or the pumping unit. The rephasing cylinders have a bypass point to allow oil to flow to the other side and there may be a stoppage at this bypass. Something as small as a tiny chip of paint may be the cause or there may be a leaking "O" ring or seal. **The hydraulic system is filled with Anti Wear ISO Viscosity 46 hydraulic fluid during manufacture of the drill.**
- 4) After servicing the cylinders, reconnect them and recycle them until the air within them is removed.
- 5) Check the hose disconnects for malfunction, or incorrect match with tractor. **See Important Note #1 and Note #2 on page 40-15.**



MAINTENANCE & SERVICE

HYDRAULIC CYLINDERS (Con't)



Bleeding the air from the hydraulic system is one of the most difficult maintenance projects. **DO NOT** remove fittings or change hoses unless necessary! Only remove fillings or hoses after drill has been lowered to planting position.

If one cylinder does not retract equal to the other, ensure that both cylinder ends are screwed on equally.

Hydraulic hose quick disconnect couplers look similar - they must be an exact matched set to work properly. If there is a problem, it may be necessary to remove both male and female ends from the hoses.



On rear drive drills, if one leg does not fully extend or retract, it will be necessary to remove the cylinder clevis and the spacers from the cylinder rod. Then cycle the hydraulic to remove air from the system.

The removal of spacers allows full retraction of cylinders and will force the air out.

During this procedure, **DO NOT** disconnect any hydraulic fittings.

HYDRAULIC HOSES

Hydraulic hose part numbers and hose lengths for FLEXII drills are listed below:

HYDRAULIC HOSE		MASTER CYLINDER 3-1/2"	SLAVE CYLINDER 3-1/4"	CYLINDER CROSS OVER	REAR DRIVE TONGUE
Model 86	End Wheel	4222X18 - 18 Ft.	4222X19 - 19 Ft.	4222X8 - 8 Ft.	None
	Rear Drive	4222X14 - 14 Ft.	4222X15 - 15 Ft.	4222X4 - 4 Ft.	Note Below
Model 88	End Wheel	4222X19 - 19 Ft.	4222X20 - 20 Ft.	4222X9 - 9 Ft.	None
	Rear Drive	4222X14 - 14 Ft.	4222X15 - 15 Ft.	4222X5 - 5 Ft.	Note Below
Model 812	End Wheel	4222X20 - 20 Ft.	4222X21 - 21 Ft.	4222X12 - 12 Ft.	None
	Rear Drive	4222X15 - 15 Ft.	4222X16 - 16 Ft.	4222X6 - 6 Ft.	Note Below
	Rear Transport	4222X15 - 15 Ft.	4222X16 - 16 Ft.	4222X6 - 6 Ft.	None
Model 816	End Wheel	4222X21 - 21 Ft.	4222X22 - 22 Ft.	4222X14 - 14 Ft.	None
	Rear Drive	4222X16 - 16 Ft.	4222X17 - 17 Ft.	4222X8 - 8 Ft.	Note Below
	Rear Transport	4222X16 - 16 Ft.	4222X17 - 17 Ft.	4222X8 - 8 Ft.	None
Model 818	End Wheel	4222X21 - 21 Ft.	4222X22 - 22 Ft.	4222X16 - 16 Ft.	None
	Rear Drive	4222X17 - 17 Ft.	4222X18 - 18 Ft.	4222X10 - 10 Ft.	Note Below
	Rear Transport	4222X17 - 17 Ft.	4222X18 - 18 Ft.	4222X10 - 10 Ft.	None
Model 822	End Wheel	4222X21 - 21 Ft.	4222X22 - 22 Ft.	4222X19 - 19 Ft.	None
	Rear Drive	4222X18 - 18 Ft.	4222X19 - 19 Ft.	4222X12 - 12 Ft.	Note Below
	Rear Transport	4222X18 - 18 Ft.	4222X19 - 19 Ft.	4222X12 - 12 Ft.	None

Note: Rear Drive requires both 4222X6 - 6 ft. and 4222X7 - 7 ft. hydraulic hoses for the tongue cylinder.



MAINTENANCE & SERVICE

CHECKING BOLT TORQUE

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

TORQUE SPECIFICATIONS				
BOLT DIAMETER	BOLT TORQUE			
	SAE 5		SAE 8	
	lb-ft	(N.m)	lb-ft	(N.m)
1/4"	9	(12)	12	(17)
5/16"	19	(25)	27	(36)
3/8"	33	(45)	45	(63)
1/2"	80	(110)	115	(155)
5/8"	160	(215)	220	(305)
3/4"	290	(390)	400	(540)
1"	630	(850)	970	(1320)

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 cap screws unless otherwise specified in this manual. When using locking elements, increase torque values by 5%. SAE type for bolts and cap screws are identified by their head markings.



MAINTENANCE & SERVICE

CHAINS

Chains listed below for FLEXII Drills are Industry Standard #2040A.

Chain Name	Chain Part #	Connector Link(s)	Connector Link(s) Part #
Chains Common To Both End Wheel And Rear Wheel Drive Drills			
Drive Chain on Leg (77 Links)	2040XA	Offset and Full Links	2040L, 2040L1
Speed Changer (39 Links)	2040D	Offset and Full Links	2040L, 2040L1
Small Seed Box (37 Links)	2040E	Half Link	2040L2
Picker Wheel (51 Links)	2040C	Full Link	2040L1
Cool Season Box Agitator (17 Links)	2040F	Offset and Full Links	2040L, 2040L1
Cool Season Box Drive (51 Links)	2040XG	Full Link or Offset and Half Links	2040L1 or 2040L, 2040L2
Chains Unique To End Wheel Drive Drills			
Leg Drive Shaft 18-Tooth Sprocket To Clutch (73 Links)	2040XB	Half Link	2040L2
Output Reduction Kit 18-Tooth Side of 18/36 Double Sprocket to Clutch (25 Links)	2040K	Offset and Full Links	2040L, 2040L1
Output Reduction Kit Leg Drive Shaft 18-Tooth Double Sprocket to 36-Tooth Side of 18/36 Double Sprocket (61 links)	2040J	Half or Full Link	2040L2 or 2040L1
Chains Unique To Rear Wheel Drive Drills			
Jackshaft to Clutch (25 Links)	2040K	Offset and Full Links	2040L, 2040L1
Leg Drive Shaft 18-Tooth Sprocket to 18-Tooth Sprocket on Input Jackshaft (69 Links)	2040M	Half or Full Link	2040L2 or 2040L1
Output Reduction Kit Leg Drive Shaft 18-Tooth Double Sprocket to 36-Tooth Side of 18/36 Double Sprocket on Input Jackshaft (75 links)	2040I	Half or Full Link	2040L2 or 2040L1



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<u>CHAINS:</u> Chains come off.	Misaligned sprockets.	Align sprockets and tighten set screws in the keyed sprockets and bearings.
	Misaligned idler.	Straighten idler. If the shaft moves after installation, drill detents in the shaft for the bearing set screws.
	Bent or damaged sprocket.	Replace the sprocket.
	Loose shaft bearings.	Tighten flanges.
	Rusty or dirty chain.	Remove from the drill and soak overnight in light oil or silicone lubricant or apply WD-40.
	Overload in one of the boxes.	Increase the size of the driven sprocket when compared to the one that drives it. For Example: the sprocket that drives the agitator in the fluffy box may have to be increased in size, in relation to the sprocket that drives it. An overloaded sprocket then overloads the chain and causes it to walk off the sprockets.
Planter support chain failure.	Incorrect chain (part #8955XA) used.	Use only "twisted link" style of chain (part #8955XA). Correct chain has 9 Links (8 Twisted and 1 Straightened)
	Tangled chain.	Replace with "twisted link" style chain (part #8955XA).
<u>ROLL PINS:</u> Breaking roll pins in the speed changer and sprockets.	Agitator is catching the picker wheels.	Bend agitator so it does not catch on picker wheel.
	Rusty and worn sprockets.	Straighten and apply silicone lubricant.
	Picker wheels catching debris in the seed.	Clean the seed before using.
	Picker wheel shaft rubbing on transition.	Loosen fluffy seed box and rotate it. Align the shaft and retighten the seed box. Check bearing support (part #10316) for alignment.
	Binding chain.	Align the sprockets. Start with the drive wheel chain and work toward the seed boxes. Re-align and tighten each chain and its idlers.
	Overfilled seed box or seed settling.	Remove seed when transporting drill or stir seed in box prior to seeding. Leave a 2" empty space at the top of the fluffy box for the seed to churn.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Breaking roll pins in the speed changer and sprockets.	Binding idlers.	Clean and lubricate the steel bushings of each idler. Be sure the idler is on the correct side of each chain. The idlers must be on the slack or non-drive side of the chain. In particular, the double idlers on the drive leg and the double idlers on the chain going to the clutch must be installed as per the attached decals. See decals 1046C10 and 1046C11.
	High torque load.	Slow down when planting. DO NOT seed at speeds greater than 7-8 m.p.h., even on the best sites. Reduce the amount of seed in the boxes. Check the sprocket ratio. To reduce the torque load on the chains, sprockets, and other drive parts, allow a small drive sprocket to drive a larger driven sprocket. In particular, the agitator sprockets <u>must</u> be larger than the sprockets that drive them.
	Fertilizer in box.	DO NOT apply fertilizer with this equipment.
CLUTCH: Clutch will not function.	Worn clutch bushings.	Replace bushings (part #1121).
	Clutch shaft key (part #1110) missing.	Replace.
	Lever in clutch housing (part #1119) is stuck.	Tap lightly with hammer and apply silicone lubricant.
	Roller dog of clutch housing is contacting the detents in the clutch hub.	Grind a small amount off the corner of the three machined bosses on the clutch hub (part #1120).
	Clutch tripper assembly is loose or positioned wrong.	Tighten the clutch tripper assembly bolts. See Pages 40-8 and 40-9 for additional information.
	Shaft collar has moved.	Loosen set screw, reposition, and retighten.
	Zirk will not take grease.	Replace zirk.
Clutch not getting grease.	Bronze bushing in clutch has rotated so that grease holes do not align.	Rotate the bushing.



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TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Short double disc bearing life (part #JD8573, #JD85024, or #JD85205).	Worn disc bolt (part # K300M & # K301M on 1998 and later models or #K200M & K201M on pre 1998).	Replace if diameter is smaller than 0.615 inches.
	Missing spacer (part #1100 or #JD8573A).	Replace the spacer.
	Broken case (part #M167768, #M1677683, or # M1677685).	Replace the case.
	Loose rivets in disc blade.	Replace rivets.
	Bent depth band.	Straighten or replace the depth band.
Discs wobble.	Buildup of mud on depth bands backside between blade and depth band.	Install depth band scrapers (part #10745A) for drills with yellow boot casting and (part #10995C) for drills with black boot casting. The scrapers will clean both horizontal bands and disc blades.
	Bent depth bands.	Straighten or replace the depth bands.
	Worn or loose bearings.	Replace the bearing (part #JD8573, #JD85204, or # JD85205).
	Bent or cracked blade.	Replace the blade.
	Loose disc bolt. The K300M bolt has right-hand threads and the K301M has left-hand threads. The shoulder diameter of the bolt should be no smaller than 0.615 inches; otherwise it should be replaced.	When reinstalling the disc bolts, it is important to clean both the bolt threads and the threads in the boot casting with solvent (such as toluene or ether). Apply a medium strength #242 Loctite to the boot threads before installing the bolt into the boot casting.
Discs not turning.	Defective inside scraper assembly.	Replace with new Assembly (part #AM11828)
	Bent disc guard.	Replace disc guard (part #38880)
	Scrapers are adjusted too tight (either inside or outside).	Loosen scraper nuts.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Discs not turning.	Drill was rolled backward when it was in the down or working position. This would cause dirt to jam between the disc blades.	Using extreme care! Hold one disc blade at a time with a vise grip, while turning its matching blade to remove the dirt between each assembly.
	Insufficient space between double discs.	Add spacers (part #1100 or JD#M15226) as needed.
	Dirt behind the depth bands.	Remove the depth band, clean, and reinstall. Service the scrapers.
Disc opener does not track.	Loose or bent assembly. The lift bracket (part #10321) may be bent. The flex knuckle may have walked or moved from its original position.	Align the lift brackets on 7-13/16" centers. Replace bent brackets as needed. Boot casting will break when removing LH bolts. RH- Bolts turn right LH- Bolts turn left
	The rubber cords may have deteriorated. Look for cracking or softness on the ends of cords.	Soft rubber cords should be replaced.
Boot (shoe) failure.	Casting breakage.	Replace and slow down on rocky sites.
	Loose subassemblies.	Check for loose, worn-out disc assemblies (part #125453C) daily and replace . Check for loose and worn Connex bushing (part #10252).
Boot Breaks	When removing LH Bolts	RH- TURN RIGHT LH- TURN LEFT
SCRAPERS:		
Short scraper life.	Bent depth band.	Straighten or replace the depth band.
	"Ears" form on scrapers.	Break off "ears" daily with pliers.
	Excessive wear.	Reduce spring preload by backing off the nuts. This will reduce the friction of the scraper against the disc blade.
	Lost scraper assemblies.	Use locking flanged nuts (part #N14-FNL & part #FN516-FNL) on the scraper assemblies or apply Loctite to the installed parts.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<p><u>PRESS WHEELS:</u> Press wheel springs fail.</p>	Press wheels support too much weight.	<p>Lower the front of the drill at the tongue clevis.</p> <p>Change spring leveler on the tongue by running both sets of double nuts toward the main frame.</p> <p>When used in three-point mode, shorten the length of the third link between the drill and the tractor.</p> <p>Drills built after Fall 1993 having press wheel torsion springs (part #10961) may have different preload by changing the spring position on the boss of the boot casting (part #0888).</p>
	Excessive load on press wheel tires.	Raise the drill on sharp turns. Slow down on rocky sites. Lower the front of the drill to reduce forces on the press wheels. Change the tongue clevis position or adjust the spring leveler.
	Press wheel rim is bent.	Straighten rim or replace press wheel. Use drag chains in rocky conditions.
<p><u>SEED BOXES:</u> Fluted-feed roll shifter levers on the small seed or cool season/grain box difficult to move.</p>	Axle bolt tightens into the "h" frame (part #10251) which locks the press wheel bearing and prevents the press wheel from turning. This results in the self-destruction of the press wheel and tire.	Refer to "Set-Up & Preparation Section" for correct procedure to install the axle bolts and machinery bushings. Failure to follow correct procedure will result in continued press wheel failure.
	Dirt or rust on the exposed fluted feed or cut-off rolls.	Increase frequency of application of WD-40 to 4-6 times/day when drilling in extreme dust.
	Locked in toque on either feed shaft.	Clean and lubricate with a dry silicone based lubricant.
	Bent roll pins on the shaft.	Turn feed shafts back and forth with a wrench while moving handle left and right.
	Seed jammed in flutes.	Replace as needed.
	Worn knob on shifter handle. Knob or boss on cool season/grain shifter should be no less than 5/8" in diameter.	Drop cup gates and clean with air hose.
	Bolt in shifter quad of cool season box is jammed.	Replace the shifter handle (part #3205).
		Correct bolt is 3/8" x 1" square head (part #B38-1SQ).



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
SEED BOXES (Con't): Fluted-feed roll shifter levers on the small seed or cool season/grain box difficult to move.	Seed cup gates are jammed with debris.	Move gate levers up and down and clean debris from the gate area with an air hose.
	Coated seed and its dust not cleaned after use from either the small seed or cool season/grain box.	First, try to remove seed from each cup with an air hose. Second, try to clean cups with high-pressure washer. When all else fails, remove the two bolts retaining each cup and one roll pin from each unit. This will allow you to move the cup aside to clean material from each flute and feed roll.
	Fertilizer applied from either cool season/grain or small seed box.	Never apply fertilizer from drill unless it is equipped with a fertilizer box attachment. Follow procedure in above item for cleaning coated seed from seed boxes.
	Worn shifter bearing on cool season box.	Replace with new thrust bearing kit (part #TM60820) used on all production after 1998.
	Missing spring (part #TS-72M).	Replace spring (part #TS-72M).
	Coupler alignment.	Small seed box coupler (part #1010) not in alignment with seed box shaft. Loosen drive end bearing and end box bolts. Align coupler with box shaft and retighten bolts and bearing.
Irregular quantities of seed coming from seed boxes.	Small seed box emptying unevenly.	Seed cups may have moved because of loose mounting bolts. Reposition and retighten.
	Feed roll flutes may be plugged.	Clean.
	Coated seed may have plugged cup.	Clean.
	Seed hoses may be kinked or plugged with debris.	Clean.
	Cool season/grain box emptying unevenly.	Seed cups may have moved because of loose mounting bolts. Reposition and retighten.
	Bridging of uncleaned seed.	Use only clean seed.
	Fluffy seed box emptying unevenly.	Tighten agitators. Tighten picker wheels.
		Clean transitions, seed hoses, and boot castings. Check and replace seed gaskets and seed gasket plates.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Irregular quantities of seed coming from seed boxes.	Small seed box coupler (part #1010) moved.	Reposition and tighten.
Clogging of seed passages.	Dirty seed.	Use only clean seed. Dirty cool season mixes may be planted from the fluffy seed box. A dirty fluffy seed mix may sometimes be handled by lowering the output ratio of the warm season speed changer.
	Wet seed.	If the drill is left with seed in it overnight, it must be put into a shed or covered with a tarp. The picker wheels are less likely to handle stems and awns if the seed gets wet or moist as they will bend and then snap back, rather than break in two as they pass through the picker wheels.
	Bent seed hose.	On rough sites, one or more seed hoses may become bent for a short distance. This allows the seed to buildup and then is released in a "slug". This may result in a plugged seedway passage.
	Storage litter.	During storage, a buildup of cobwebs and mice nests will plug hoses. Remove and clean all hoses before use.
Cool season seed box feed shaft "walks".	Excessive wear on the shifter bearing.	Order a replacement thrust washer kit (part #TM60820) for drills built 1975 to mid 1998. For drills built after mid 1998, order replacement parts as needed. See Page 40-2 for a detailed drawing.
<u>FLUFFY SEED BOX:</u> Too little seed from the fluffy seed box.	Wrong setting of the speed changer.	When standing at the tongue looking at the drill, the lowest output is when the speed changer chain is to the far right . Each step to the left increases the output.
	Restriction in the seed box.	If seed gaskets and retainer plates are in place, remove them . Use only commercially cleaned seed. Hand collected seed should be cleaned.
	Wrong sprocket.	Reduce the size of jackshaft sprocket (the end above the ground wheel). OEM is 30 tooth.
	Restriction in the seed passageway.	Clean the seed hose. Clean the transition. Clean the dirt from between the discs and within the boot casting.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<p><u>FLUFFY SEED BOX:</u> Too much seed from the fluffy seed box.</p>	Excessive seed feed rate.	<p>Add seed gaskets and retainer plates to fluffy seed box.</p> <p>Add the optional Output Reduction Kit to the drill. This will reduce output from all seed boxes on the drill by 50%. See Page 30-13 for part #.</p>
	Wrong sprocket.	<p>Increase the size of the jack shaft sprocket (the end above the ground wheel). OEM is 30 tooth.</p> <p>Increase the clutch sprocket size. OEM is 30 tooth.</p> <p>Increase the picker wheel shaft sprocket size. OEM is 30 tooth.</p>
	Seed too fine.	<p>Use a different seed box. Place seed in the cool season/grain seed box.</p> <p>Add inert filler, such as ground corncobs, cottonseed hulls, bran, etc.</p> <p>Add seed gaskets and retainer plates.</p> <p>Place tape on the bottom of the box to restrict the slot next to the picker wheels.</p> <p>Remove chain to the agitators in the fluffy box.</p>
<p><u>COOL SEASON/GRAIN BOX:</u> Too little seed from the cool seed box.</p>	Plugged seedway passage.	<p>Straighten kinked hose.</p> <p>Remove debris from the seed hose.</p> <p>Clean bent or plugged metal seed tube (on drills built prior to September 1993).</p>
	Green seed cup.	<p>Lower the gate for larger size seeds.</p> <p>Clean the flutes.</p> <p>Adjust flutes to the maximum open position.</p>
	Dirty seed.	Clean the seed or try using the fluffy seed box.
	Excessive seed feed rate.	Add the optional Output Reduction Kit to the drill. This will reduce output from all seed boxes on the drill by 50%. See page 30-13 for part #.
	Double sprocket on end of box is too small.	Change the double sprocket. Use double sprocket (part #3095X1 in place of part #3095X).
<p>Too much seed from the cool season box.</p>		



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<p><u>SMALL SEED BOX:</u> Too little seed from the small seed box.</p>	<p>Plugged seedway passage.</p>	<p>Clean cup assembly.</p> <p>Clean seed hose.</p> <p>Clean seed.</p> <p>Use only dry seed.</p> <p>Check hose for collapse.</p> <p>Adjust flutes to the maximum open position.</p> <p>Check for loose cup that may have moved to a more closed position.</p>
<p>Too much seed from the small seed box.</p>	<p>Excessive seed feed rate.</p>	<p>Adjust flute opening to a smaller or more closed position.</p> <p>Add the optional Output Reduction Kit to the drill. This will reduce output from all seed boxes on the drill by 50%. See Page 30-13 for part #.</p> <p>Increase the size of the sprocket on the end of the small seed box. OEM is 20 tooth.</p>
<p><u>MAIN FRAME:</u> Main frame or axle breakage.</p>	<p>Many possible causes.</p>	<p>Slow down when seeding on slopes and ditch banks.</p> <p>Correct preload on axle nut.</p> <p>DO NOT tow drill at posted highway speeds. TOW AT A SPEED OF 20 MPH OR LESS.</p> <p>Service wheel bearings (i.e. check and repack) on a regular basis.</p> <p>Check wheel lug nuts for tightness. Torque wheel lug nuts to 75 to 85 Foot Lbs.</p>
<p><u>HYDRAULICS:</u> Flex hydraulic failure.</p>	<p>Improper hose connection to hydraulic cylinders.</p> <p>Improper hose connection to tractor hydraulics.</p>	<p>See Parts Catalog – Hydraulic Assemblies.</p> <p>See Parts Catalog – Hydraulic Assemblies.</p>



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<u>HYDRAULICS (Con't):</u> Flex hydraulic failure.	Incorrect quick disconnects on either tractor or drill.	Check compatibility as many disconnect brands do not interconnect. Also, different models of the same brand do not always interconnect. Relieve pressure from the tractor hydraulics before attempting to connect to the drill. It may be necessary to relieve hydraulic pressure (without disconnecting hydraulic fitting) prior to connecting the hydraulic quick disconnects.
	Dirty or damaged hydraulic quick disconnects.	Keep all hydraulic quick disconnect fittings clean and covered when not in use. Wipe clean before connecting and do not pound or hammer on the "ball fitting" on the "male" disconnect to relieve pressure on the line. Be aware of hydraulic pressure. Use extreme caution when working with hydraulic fluids.
	Damaged, frayed, or bent hydraulic hoses.	Hydraulic hoses that are routed between the drill from the front tower to the rear of the drill must be covered with hose guard (part #42221). This will protect and prevent hose damage in areas where they come in contact with the drill frame parts.
	Hydraulic system is air-locked.	Follow procedures outlined in the Maintenance and Service Section of this manual.
<u>NO- TILL:</u> No-till units do not penetrate.	Insufficient weight transfer to no-till units.	Change clevis position. Rear drive drills have 3-1/2" of spacers on the non-drive side and 4-1/2" of spacers on the drive side to prevent full retraction. If the drill does not raise and lower evenly these may have to be removed temporarily to allow full movement of the hydraulics to clear air from the system. After cycling the hydraulics, reinstall the spacers and clevis.
		Change the position of the tongue mounting point to the drill frame to lower the front of the drill. Adjust spring leveler. Refer to adjustment procedure on Page 20-5, Item #6. Change draw bar position on the tractor. Check for loose or worn disc blades or no-till blades.



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<p><u>NO- TILL (Con't):</u> No-till units do not penetrate.</p>	<p>Insufficient weight transfer to no-till units.</p>	<p>Change style and size of no-till blades.</p> <p>Lower shanks of no-till assemblies.</p> <p>Adjust jackscrow (part #B12-2TH) on no-till torsion assembly.</p>
	<p>Excessive field speed for field conditions.</p> <p>Seedbed requirements do not match equipment.</p>	<p>Remove stroke control blocks on rephasing cylinders, if installed.</p> <p>Reduce ground speed.</p> <p>Sod seeding will require the 13-1/2" notched no-till blade. Fields with loose residue cover, such as winter wheat or corn residue may require the 18" notched blade. The larger blade will help prevent "snow plowing" the litter. In soybean residue or corn residue from very high yields the 17", 25-wave blade may perform better.</p> <p>Drilling along ditches, roadsides, swales, and other site specific conditions may require a narrower drill to allow the majority of disc openers to contact the ground at all times.</p>
<p>No-till planting units are not tracking.</p>	<p>Disc openers are out of alignment.</p>	<p>Straighten lift bracket (part #10321), if bent. Check alignment from back of drill.</p> <p>Rubber torsion knuckle may have moved left or right. Loosen the four retaining bolts (part #B38-1.25) and carefully move the knuckle back into position.</p>
	<p>No-till units are out of alignment.</p>	<p>Clamp plates (part #4211 or #5211) are not equally spaced.</p> <p>Clamp plates (part #4211 or #5211) may be broken or twisted. Inspect and replace as needed.</p> <p>Shanks (part #42201X, #4220X1, and #52201X) are bent or twisted.</p> <p>Caution! Shanks (part #52201X) are made from spring steel and will not straighten. If bent, they must be replaced. This includes all production after early 1993.</p>



TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
<u>ACRE METER:</u> Acre meter tallying incorrectly.	<p>Double tracking or leaving too wide a space between rows on each trip across the field.</p> <p>Land area contains more or less area than assumed.</p> <p>One or more sprockets between the ground wheel and the acre meter have been changed.</p> <p>Circle drilling with the drive wheel on the outside of the turn will give a false reading from the acre meter.</p> <p>Output reduction feature in use.</p>	<p>Leave the same amount of space between each seeded strip as the furrow opener spacing on the drill.</p> <p>Double-check the "facts".</p> <p>If sprocket combination has been changed from the OEM standard, then calculate the area covered. See procedure on Page 30-17.</p> <p>Acre meter will read 1/2 of actual acres planted. Multiply acre meter reading by 2 for actual acres planted.</p>