MONOSEM

Precision Vacuum Planters

MS Mini Seed

Operator & Parts Manual

For Versions A, B, C, D, E

Includes Instructions for:

- Safety
- Operation
- Maintenence

op&parts.08

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 This symbol means:

ATTENTION
BECOME ALERT
YOUR SAFETY IS INVOLVED.

When you see this symbol on the machine or in this manual, be alert to the potential for personal safety. Follow all recommended precautions. Safety of the operator is one of the main concerns in designing and developing a new piece of equipment. The operator can avoid many accidents by observing the warning signs.

Keep the safety warning signs clean and readable. Replace all damaged warning labels on your machine that are not readable or are missing.

The signal words used in this manual or on the machine are DANGER, WARNING, and CAUTION. The appropriate signal word for each has been selected using the following guidelines:

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed, or to alert against unsafe practices.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury, or to alert against unsafe practices.

Listed below are safety precautions that should become standard practice before and during operation, transport, and maintenance of the planter.

 **General Safety**

Carefully study and understand this manual.

Do not wear loose fitting clothing which may catch in moving parts.

It is recommended that suitable protective hearing and safety glasses be worn.

The operator may come in contact with certain materials which may require specific safety equipment, relative to the handling of such materials (examples: extremely dusty, molds, fungi, bulk fertilizers, insecticides, etc).

Assure that planter tires are inflated evenly.

Give the planter a visual inspection for any loose bolts, worn parts or cracked welds, and make necessary repairs. Never operate any equipment that is not in safe working condition.

Be sure that there are no tools lying on or in the planter.

Do not hurry the learning process or take the unit for granted. Ease into it and become familiar with your new planter.

Practice operation of your planter and its attachments. Completely familiarize yourself and other operators with its operation before using.

Do not allow anyone to stand between the tongue or hitch and the towing vehicle when backing up to the planter.

Always make sure there are no persons near the planter when the wings are being lowered from transport position.

Before applying pressure to the hydraulic system, make sure all connections are tight and that hoses and fittings have not been damaged. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin causing injury.

Install lock ups on markers, as provided prior to transporting the planter or working around the unit.

 **During Operation**

Beware of bystanders, particularly children! Always look around to make sure that it is safe to start the engine of the towing vehicle.

Use necessary safety lights and devices and observe legal regulations before transporting on public roads.

No passengers allowed anywhere on, or in the planter during operation.

Be especially observant of the operating area and terrain – watch for holes, rocks or other hidden hazards.

Always inspect the area to be planted prior to operation. Do not operate near the edge of drop-offs or banks. Be extra careful when working on inclines.

Do not operate on steep slopes as overturn may result.

Keep hands and clothing clear of moving parts.

Always make sure there are no persons near the planter when the marker assemblies are in operation.

If a marker cylinder has been removed for any reason, do not attach the rod end of the cylinder until the cylinder is cycled several times to remove any air that may be trapped in the system.

Serious injury or death can result from contact with electric lines. Use care to avoid contact with electric lines when moving or operating this machine.

This planter is designed to be driven by ground tires only. The use of hydraulic, electric or PTO dives may create serious safety hazards to you and the people nearby. If you install such drives you must follow all appropriate safety standards and practices to protect you and others near this planter from injury.

Lower the planter when not in use and cycle the hydraulic control lever to relieve pressure in hoses.

Following Operation

When halting operation, even periodically, stop the tractor, set the tractor or towing vehicle brakes, disengage the PTO and all power drives, shut off the engine and remove the ignition key.

Store the planter in an area away from human activity.

Do not permit children to play on or around the stored planter.

The planter should be stored in a dry and dust-free location with the hydraulic cylinders closed.

Engage all safety devices for storage.

Wheel chocks may be needed to prevent the parked planter from rolling.

Performing Maintenance

Good maintenance is your responsibility.

Make repairs in an area with plenty of ventilation. Never operate the engine of the towing vehicle in a closed building. The exhaust fumes may cause asphyxiation.

As a precaution, always recheck the hardware on equipment following every 100 hours of operation. Correct all problems.

Before working on the planter, stop the towing vehicle, set the brakes, disengage the PTO and all power drives, shut off the engine and remove the ignition keys.

Never work under the planter while it is in a raised position.

Be certain all moving parts have come to a complete stop before attempting to perform maintenance.

Always use the proper tools or equipment for the job at hand.

Never use you hands to locate a hydraulic leak. Use a small piece of cardboard or wood. Hydraulic fluid escaping under pressure can penetrate the skin. If injured by escaping hydraulic fluid, see a doctor at once. Gangrene can result. Without immediate medical treatment, serious infection and reactions can occur.

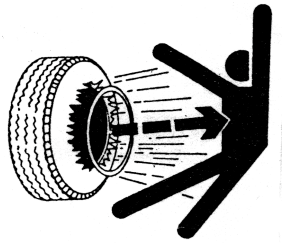
Replace all shields and guards after servicing and before moving.

After servicing, be sure all tools, parts and service equipment are removed.

If the planter has been altered in anyway from the original design, the manufacturer does not accept any liability for injury or warranty.

Tire Safety

Inflating or servicing tires can be dangerous. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job. Whenever possible, trained personnel should be called to service and/or mount tires.



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

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.

Drive Line Safety

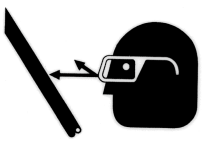
DANGER Rotating drive line contact can cause death – keep away. Do not operate without all driveline, tractor and equipment shields in place; without drivelines securely attached at both ends, and without driveline shields that turn freely on driveline.

Hydraulic System Safety

DANGER Before applying pressure to the hydraulic system, check that all connections are tight and that the hoses and fittings have not been damaged. Hydraulic fluid escaping under pressure can penetrate the skin causing serious injury. If injured by escaping hydraulic fluid see a doctor at once. Gangrene can result.

Relieve pressure on system before repairing or adjusting or disconnecting.

Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.



Keep all components in good repair.

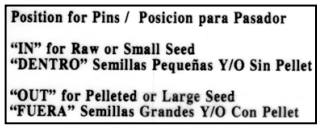
Shown below are various safety stickers, part number and location. Keep the safety warning signs clean and readable. Replace all damaged warning labels on your machine that are not readable or are missing.

ST053
On front of hopper of the inside wing unit of the stacking toolbar

ST055
On inside of the granular hopper lid

ST054
On front toolbar

ST056
On front of pull-type toolbar



ST051
On MS metering box

ST052
On row marker

ST057
On PTO shaft

ST050
On front of toolbar

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3- Point Mounted Planters

For the initial preparation of the planter, lubricate the planter and row units. Make sure all tires are properly inflated, that all drive chains have the proper tension, alignment and lubrication.

 **CAUTION** Before starting up the planter, check that all main bolts are properly tightened and that planting units are equipped with the proper seed disc. Also check that the shutters inside the metering boxes are adjusted correctly. (See Metering Box.) Check daily to see if the bolts of the hitch are tight as loose bolts can cause the brackets to break.

 **WARNING** The PTO shaft should be at a reduced angle during lifting. If the angle is too steep, reduce the PTO speed at the end of the field. (Normally the seed will remain under suction even at 400 rpm.)

 **CAUTION** Except when absolutely necessary, do not leave the turbofan running when the planter is in a raised position.

When planting small seeds (rape, cabbage, uncoated sugarbeet), make sure that the hoppers fit tightly at the bottom. This may be improved if necessary by using a sealant. When planting these small seeds, it is recommended to fill the hopper only one-third full.

LUBRICATION

Proper lubrication of all moving parts will help ensure efficient operation of your Monosem planter and prolong the life of friction producing parts.
All bearings (wheels, disc openers, turbofan, and metering box) are self-lubricated for life and therefore no additional greasing is necessary.

The gauge wheel arms may require daily greasing.

The hub of each drive wheel requires greasing once per season.

A general lubricant each day of the chains for the seed spacing gearbox, drive wheel blocks and metering units is recommended (preferably with a chain lubricant which does not attract dust).

NOTE: For 5 x 5 Mounted machines, before starting up the planter, grease the hexagonal shaft where the upper sprocket cluster of the gearbox slides to allow easier alignment of the sprockets.

Also lubricate the claws of the safety clutch of each planting unit to allow for disengagement in case of a blockage.

Oil the chain rollers and shafts of the metering unit chain moderately.

All transmission and drive chains should be lubricated daily with a chain lubricant (which does not attract dust). Extreme operating conditions such as excessive dirt, temperature or speed may require more frequent lubrication. If a chain becomes stiff, it should be removed, soaked and washed in solvent to loosen and remove dirt from the joints. Then soak the chain in oil so that the lubricant can penetrate between the rollers and bushings.

LUBRICATE WHEEL BEARINGS

Wheel bearings should be repacked with clean, heavy-duty axle grease once a year or at the beginning of each planting season. This applies to all drive wheels, transport wheels, and marker hubs.

LUBRICATE GREASE FITTINGS

Those parts equipped with grease fittings should be lubricated at the frequency indicated with SAE multipurpose type grease. Be sure to clean the fitting thoroughly before using a grease gun. The frequency of lubrication recommended is based on normal operating conditions. Severe or unusual conditions may require more frequent attention.

There are a number of sealed bearings on your planter to provide trouble free operation. These sealed bearings are lubricated for life.

Frequency of lubrication for:

Chain lubricant

DAILY

- Unit drive chains
- Wheel block drive chains
- Transmission chains & rollers
- Insecticide drive chains
- Liquid fertilizer squeeze pump drive
- Chain rollers and shafts on unit

Grease

DAILY

- Gauge wheel arms
- Row marker hinge points

WEEKLY

- Row unit closing wheel/disc closing assembly pivot points.

3- Point Mounted Planters

CHAIN TENSION ADJUSTMENT

The drive chains are spring loaded and therefore self-adjusting. The only adjustment needed is to shorten the chain if wear stretches the chain and reduces spring tension. The pivot point of these idlers should be checked periodically to ensure they would rotate freely.

TIRE PRESSURE

Tire pressure should be checked regularly and maintained as follows:

Transport ground drive: 7.60 x 15 35 PSI (7x7)
5.90 x 15 36 PSI (5x5)

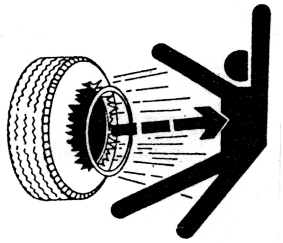
DANGER Rim and tire servicing can be dangerous. Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job. Only properly trained and equipped people should do this job.

Maintain the correct tire pressure. Do not inflate the tires above the recommended pressure.

When inflating tires, use a slip-on air chuck and extension hose long enough to allow you to stand to one side, and not in front of or over the tire assembly. Use a safety cage to enclose the tire and assembly when inflating.

Inspect tires and wheels daily. Do not operate with low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



VALVE BLOCK ASSEMBLY INSPECTION

The valve block assembly consists of the marker sequencing and flow control valves in one assembly. The sequencing valve consists of a chambered body containing a spool and series of check valves to direct hydraulic oil flow. Should the valve malfunction, the components may be removed for inspection as follows:

1. Remove valve block assembly from planter
2. Remove detent assembly and port adapter assemblies from rear of valve block.
3. Remove plug from both sides of valve block and remove spool.
4. Inspect all parts for pitting, contamination or foreign material. Also check seating surfaces inside the valve. Replace any parts found to be defective.
5. Lubricate spool with light oil and reinstall. Check to be sure spool moves freely in valve body.

Important: Make sure the correct check ball(s) and spring are installed in each valve bore before reassembly.

A flow control valve is located on each side of the block assembly. The flow control valves should be adjusted for raise and lower speed as part of the assembly procedure or upon initial operation. If the valve fails to function properly or requires frequent adjustment, the needle valve should be removed for inspection. Check for foreign material and contamination. Be sure the needle moves freely in adjustment screw. Replace any components found to be defective.

3- Point Mounted Planters

TRACTOR PREPARATION & HOOKUP

Consult your dealer for information on the minimum tractor horsepower requirements and tractor capability. Tractor requirements will vary with planter options, tillage and terrain. Check your tractor manual for specific detailed information regarding the operation of your tractor.

1. Set tractor rear wheel spacing at double the planter row spacing. On wide front-end tractors set the front wheel spacing equal to rear wheel spacing. Check tractor operator's manual for correct front and rear tire pressure.

2. Adjust the lift links on the tractor so the planter will lift level from side to side and raise high enough for planter transport clearance. Set the sway blocks on the tractor in position to prevent side sway. Be sure the individual lift link arms are in the float position.

3. Back the tractor up to the planter. Position the lower hitch pins and spacers for your type of tractor hitch. Line up the holes. Insert the hitch pins that are provided through the hole to lock in place. It may be necessary to change the length of the upper link with the adjusting handle.

Note: If the tractor has an adjustable center link, using the lowest adjustment hole will provide maximum clearance in the raised position and yet allow the planter to remain level during field operation.

DANGER Never transport folding models with lift assist wheels without a quick hitch in place. If a quick hitch is not in place, a sudden stop could allow the toolbar to rotate forward causing serious personal injury or damage to the equipment.

4. Connect the PTO drive shaft to the tractor. In addition to a standard 450/540 rpm PTO, a 1000-rpm shaft is available.

CAUTION Make sure that you connect the proper end of the PTO to the tractor. An arrow on the PTO indicates the end that is attached to the tractor.

The following sticker is placed on your PTO shaft for your safety.

DANGER Rotating driveline contact can cause death – keep away. Do not operate without all driveline, tractor and equipment shields in place, without drivelines securely attached at both ends, and without driveline shields that turn freely on driveline.

5. Connect the hydraulic hoses to tractor ports in a sequence that is both familiar and comfortable to the operator.

DANGER: Before applying pressure to the hydraulic system, make sure all connections are tight and hoses and fittings have not been damaged. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin, causing injury or infection.

CAUTION Always wipe hose ends to remove any dirt before connecting couplers to tractor parts.

NOTE: Double check that the locking sleeves or locking pins on the row markers are in working position.

6. Raise the planter slowly and watch for any interference. Remove pin from each parking stand and raise each to the transport. Secure stands in the raised position with the pin in the lowest hole.

7. Slowly lower the planter so the drive wheels rest on the ground, and check to be sure that the planter is level. Readjust the top link as required to level row units.

CAUTION As a general safety practice and to avoid damage to the tractor hydraulic system, always lower the planter when not in use.

IMPORTANT: Check daily to see if the bolts of the hitch are tight as loose bolts can cause the brackets to break.

3- Point Mounted Planters

LEVELING THE PLANTER

For proper operation of the planter and row units, it is important that the unit operate level.

With the planter lowered to proper operating depth, check to be sure that the frame is level fore and aft (front to back and side to side). Recheck once the planter is in the field.

Tire pressure can affect the lateral leveling of the planter. Maintain the tire pressure as mentioned in this section.

On planters equipped with the optional dual lift assist wheels, adjustment holes on the lift assist cylinder mounts allow for adjustment for lift height and adjustment for leveling the planter frame. Depth stops on the lift assist cylinders can be added or removed for additional adjustment.

TRANSPORTING THE PLANTER

CAUTION: Use necessary safety precautions such as safety lights and devices.

Observe legal regulations before transporting the planter on public roads.

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.

Do not carry passengers on transported equipment.

Make sure to clear any obstructions overhead and to the side of the implement while transporting.

Make allowances for increased length and weight of the planter when making turns, stopping, etc.

OPERATING SPEED

The operating speed needs to be selected as a function of:

- The desired consistency in the row
- The ground conditions
- The density of the seed

OPERATING SPEED

A high speed is not conducive to accuracy, especially in rough or rocky conditions that causes the unit to bounce.

Likewise, a high seed density may cause the disc to rotate fast, thus burdening the metering.

It should be noted, and especially for corn, that misshapen and angular seeds are difficult to sow regularly, particularly at high working speeds.

A base speed of 3 ½ to 4 ½ mph (5-7 km/h) assures good results for most seeds in the majority of conditions. However, when planting corn at lighter population more than 6" (15 cm) between the seed, 5-6 mph (8-10 km/h) is quite possible.

For planting of high seed population such as peanuts, edible beans, and kidney beans, best results can be obtained by not going faster than 3-4 mph (4.5-6 km/h).

FIELD TEST

Before the initial operation of the planter, a field test is advised. Check for the following:

- That the planter is level (front to back and side to side)
- Check that the hydraulics of the 3-point hitch of the tractor is in a float position while planting.
- That all of the row units are running level and remain parallel to the ground when planting.
- Check that each metering unit is metering properly (see metering unit section).
- Check that the seed disc you are using has the proper number of holes and proper diameter of holes for the type of seed you will be planting (see Seed Disc section in chapter 6 – Row Unit).
- Check that the row markers are adjusted properly.
- Check that you are using the proper application rates of chemicals on all rows.
- Check that you have set the desired depth of seed placement and checked your seed population on all rows.

3- Point Mounted Planters

CHECKING SEED POPULATION

1. Only one planting unit is necessary to check your seed population. Tie up the sets of closing wheels on one unit with a heavy cord or light chain. It may be necessary to decrease the tension of the closing wheel arm.

2. Put seed in the seed hopper.

3. Begin planting. At the end of a short distance (for example 100 yards or 90 meters) check to see if seed is visible in the seed trench. Make adjustments in your seed depth if necessary.

4. Measure off 1/200 of an acre of the test row just planted. Use the chart below to find the approximate distance. Mark this distance with flags.

Count the seeds within the distance between the flags. Multiply the number of seeds counted in this distance by 200. This will give you the total number of seeds planter per acre.

Length of Row in Feet

Fraction Of Acre	Row Width 22"	30"	36"	40"
1/200	119	87	72 ½	66

Note: When viewing the test row for seed population and placement, remember that the closing wheels were tied up in a raised position. Therefore, the seeds may have rolled or bounced and will affect your seed placement for accuracy.

UNHOOKING THE PLANTER

WARNING: Before unhooking the planter from the tractor, fully extend the jack stands to the point where the toolbar will remain level. Lock the stands securely in place with the locking pins.

TOOLBAR STANDS

One or two toolbar stands are located on the front of the main frame. Do not position the stands directly behind the tractor tire or they will hit when the planter is raised. Planters with front mounted drive wheels do not require toolbar stands.

1. Lower the planter to the ground. Set the tractor or towing vehicle brakes, disengage PTO and all power drives, shut off the engine and remove the ignition key.

2. Unhook the tractor lift arms from hitch pockets and remove center link. If a quick attach is used, position levers so that the locking mechanism is in the “unlatched” position and lower.

3. When the lift arms or quick attach arms are clear of the tractor, slowly drive the tractor away from the planter.

STORAGE

After the season, thoroughly clean the machine, especially the metering boxes. The microgranular applicator should be completely emptied and the fertilizer applicator scraped of any fertilizer residue. After emptying the trap doors, turn the shafts manually to remove any residual product from the mechanism.

- Except for the microgranular applicator, protect all metal parts against oxidation by applying a coat of oil or diesel fuel.
- Grease the exposed areas of cylinder rods. Also grease or paint the disc openers to prevent rust.
- Inspect and replace any worn parts at the end of the planting season. New parts are available for replacement from your dealer.
- Remove all trash that may be wrapped on sprockets or shafts and remove dirt that can draw and hold moisture.
- Clean all drive chains and coat with a rust preventative spray, or remove chains and submerge in oil.
- Lubricate planter and row units at all lubrication points.

The planter should be stored in a dry and dust-free location with the hydraulic cylinders closed.

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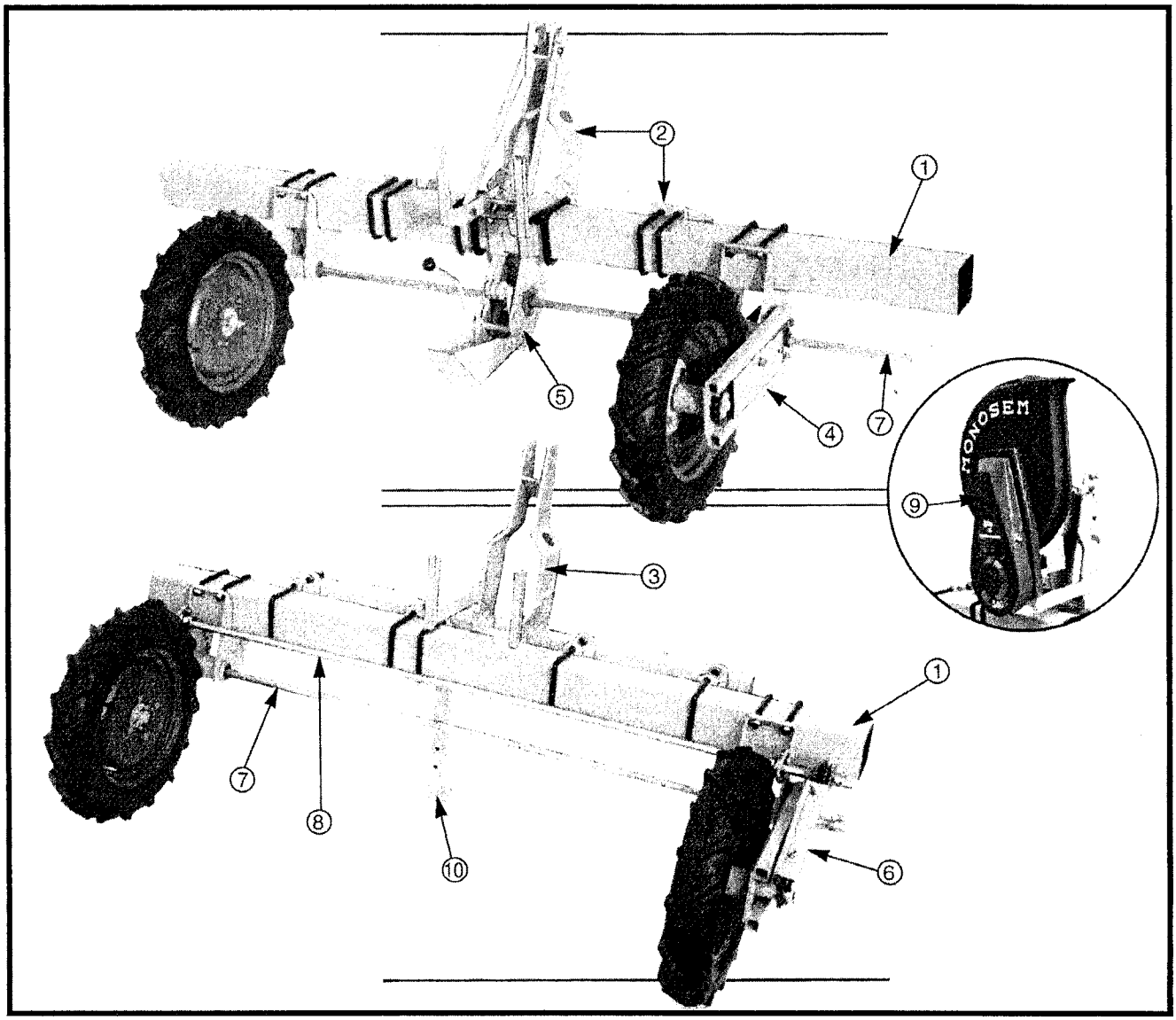
MS Mini Seed Planter

A **MS** mini-seed planter frame consists of:

- Toolbar **(1)** the length of which depends on the number of rows and the row spacing.
- 3-point hitch
  - The standard version **(2)** is for row spacing of more than 14" (36cm) and an even number of row units.
  - Or the special vegetable hitch **(3)** for easy changes of row spacing.
  - Or the double toolbar hitch for larger planters.
- Drive wheel blocks, two of them, one left block and one right block for planters of less than 12 rows; or four blocks, two left wheel blocks and two right wheel blocks for planters of 12 rows or more, which can be adjusted in height. Wheel blocks are equipped with various sizes of tires according to the row spacing and the number of rows (500x15 width 12cm or 5.0x15 width 14cm).
  - Either a standard version 4 for use with spacing gearbox 5 (top photo) for planters with row spacing of more than 14" (36cm).
  - Or a combination version with a spacing gearbox 6 (bottom photo) for use on planters with narrow row spacing.
- Hex shafts, two, driver **(7)** and receiver **(8)** (receiver hex shaft not shown in top photo.)
- Turbofan, 16 or 28 outlets **(9).**
- Toolbar stands, two, **(10).**
- Row markers optional.



MS Mini Seed Planter

WHEEL BLOCKS

There are two versions of wheel blocks. The two versions of wheel blocks are the standard version, as shown in figure 4, and the combination version, shown in figure 6, which has an incorporated spacing gearbox.

These wheel blocks can be adjusted in height using the series of holes (3) for planting on flat ground or on beds. Check that the locks and springs on the differential systems (4) are correctly positioned and in working order. After having positioned the shafts (5 or 6) check the alignment of the chains and then lock the shaft into position by means of the bushing stops. On the standard wheel blocks adjust the tension of the chain at the tightener (7.)

For the setting of the sprockets of the combination wheel block, read first the section entitled - Seed spacing gearbox on combination drive wheel block - and corresponding gearbox chart

IMPORTANT: The tire pattern on the planter wheels are mounted in the opposite direction of the tractor tires (observe the patterns).

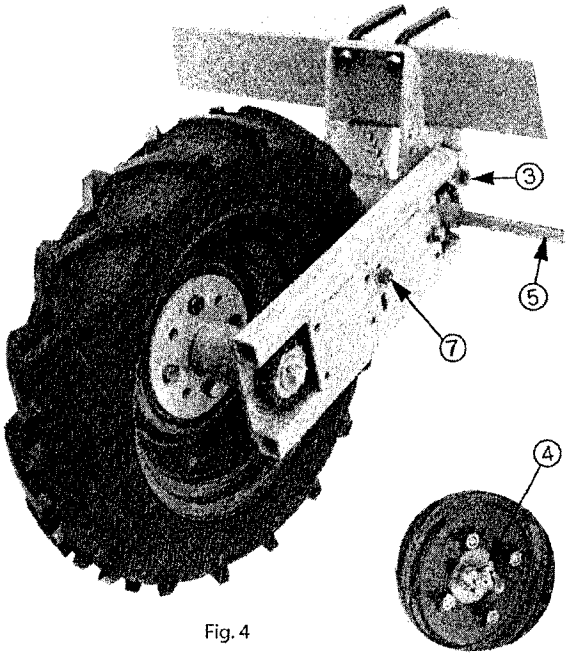


Fig. 4

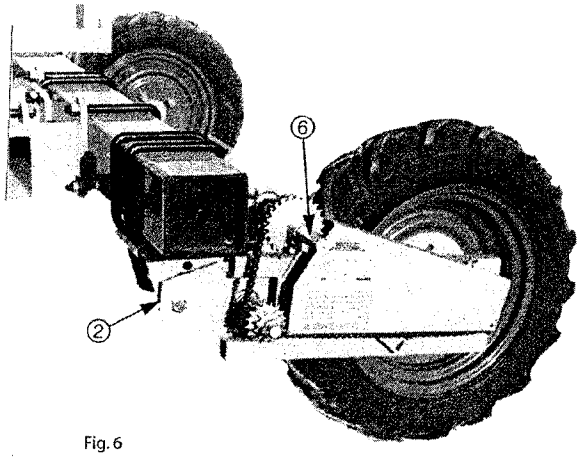


Fig. 6

ADJUSTABLE DRIVE WHEEL

Refer to Figure 1.

A. To lower the drive wheel, turn the hand wheel (1) counterclockwise.

B. To raise the drive wheel, turn the hand wheel (1) clockwise. The spring loaded drive wheel adjustment assembly is intended to act as a "shock absorber" on each drive wheel block. It will allow the drive wheel to flex up and down with variances in the seedbed, yet maintain contact with the soil surface and let the toolbar remain at approximately the proper operating height. To make the drive wheel block rigid, tighten the nylon locknut (2) on top of the spring housing all the way down (clockwise). This will compress the spring inside the housing and minimize any upward or downward travel of the wheel block. You may still raise and lower the drive wheel by turning the hand wheel (1) in directions A and B above. The complete assembly may be ordered as part No. 650610 and includes all items shown in figure 2.

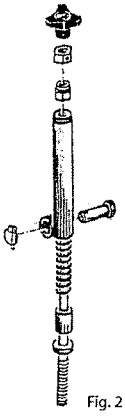


Fig. 2

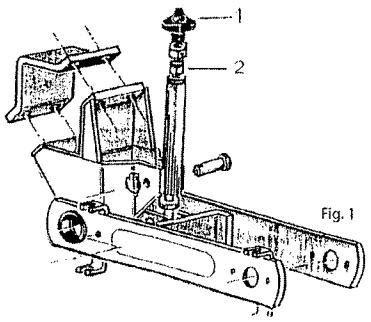
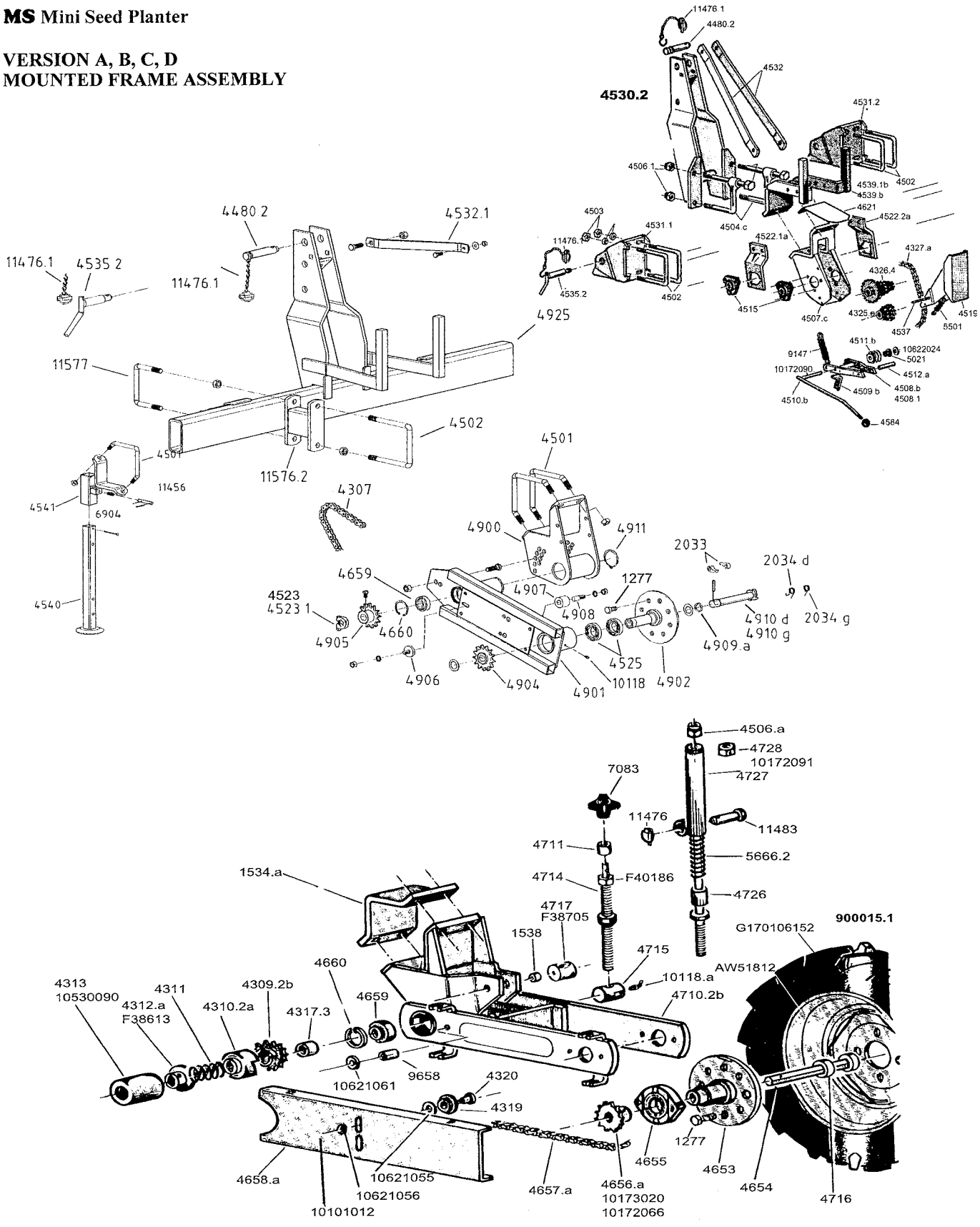


Fig. 1

MS Mini Seed Planter

VERSION A, B, C, D
MOUNTED FRAME ASSEMBLY



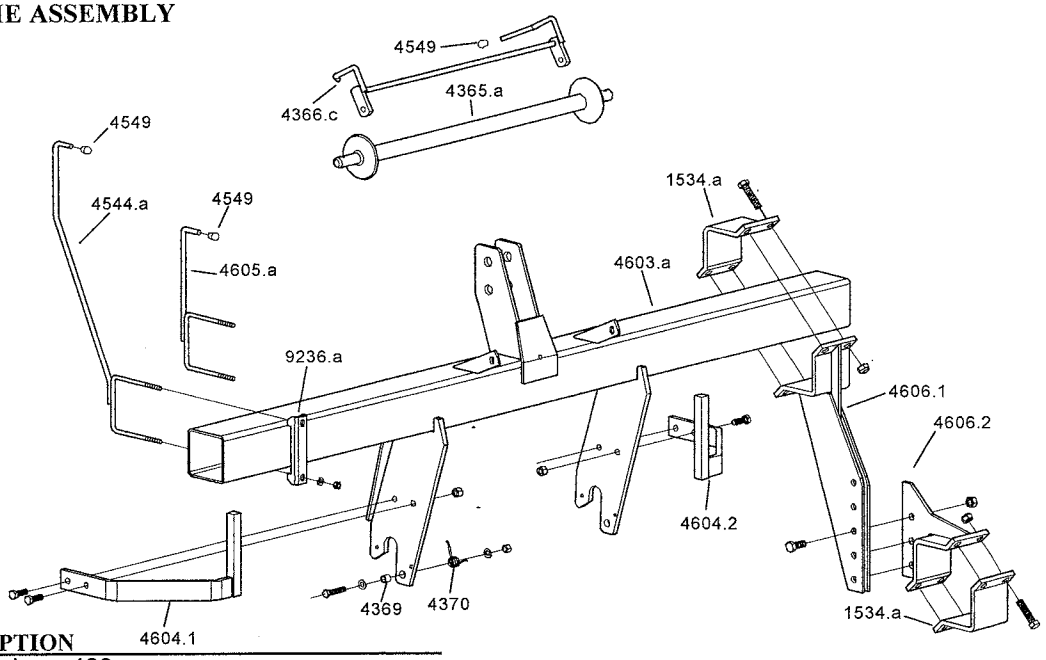
MS Mini Seed Planter

VERSION A, B, C, D MOUNTED FRAME ASSEMBLY

PART No.	DESCRIPTION
1277	Lug nut and bolts, 14mm x 30mm
1538	Spacer bushing, 12 id x18 od x10mm long
2033	Clutch ratchet
4308	Hub, fixed drive wheel
4311	Spring Slipclutch
4313	Housing Slipclutch, uses 6x10 Phillips Head
4317.3	Hex Spacer, 33mm
4319	Chain Tightening Idler
4320	Pin for Chain Tightener, w/ 12mm nut
4326.4	6 sprocket upper cluster (10-12-14 tooth)
4480.2	Upper hitch pin, 1" diameter.
4501	V bolt, 16 mm
4502	U bolt, 16 mm
4503	Locking nut, 16 mm
4507.1	Narrow gearbox housing
4508.1	Narrow gearbox lever
4515	BEARING, HEX BORE W/FLANGETTES
4515.1	Bearing 7/8 hex bore
4515.2	Flangette
4517	Toolbar cap
4519	Gearbox housing shield
4520	Hexagon drive shaft, specify length
4523	Bushing stop
4523.1	LOCK COLLAR, 7/8" HEX ,W/CROSS
4525	Ball bearing, drive whl
4530.2	Mast 3-point hitch
4531.1	Lower left bracket, 3-point hitch
4531.2	Lower right bracket, 3-point hitch
4532	Straps, 3-point hitch, 565 mm
4532.1	Turbofan support strap, 340 mm
4535.1	Hitch pin
4535.2	Hitch pin
4537	Gearbox door pin
4540	Standard frame support stand
4541	Toolbar stand bracket
4584	Gearbox knob handle
4621	Gearbox shield
4653	Hub Drive Wheel, 8 Hole
4654	Spindle, Hex shaped, for Collar
4655	Pillow Block Complete w/Bearing
4659	Bearing
4660	Snap ring, 52 internal
4711	Spacer bushing, 20x 30x 25
4714	Threaded rod (standard adj)
4715	Threaded pivot pin
4716	Spacer for spindle (8mm hex bore)
4717	Pivot pin (takes 12x25 bolt)
4726	Threaded shaft on spring loaded adj
4900	Fixed frame, MS adj drive whl blck
4901	Articulated arm, MS adj drive whl blck
4902	Hub, MS adj drive whl blck
4904	Drive sprocket, MS drive whl blck
4905	Receiving sprocket, MS drive whl blck
4906	Sprocket washer stop
4907	Roller tightener, MS drive whl blck
4908	Roller tightener shaft
4911	Snap ring (E 60)
4917.12	Interchangeable drive sprocket, 12 tooth
4917.14	Interchangeable drive sprocket, 14 tooth
4917.16	Interchangeable drive sprocket, 16 tooth
4920	Chain, special MS drive whl blck- 100 link
4921	Tension idler arm
4924	PIN, STORAGE SPROCKET MS

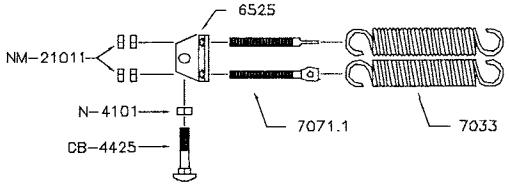
PART No.	DESCRIPTION
4925	Hitch bar
5021	Self-lubricating bushing
5501	Spring
5666.2	Spring
6904	Spring, toolbar stand
7083	Depth Control Handwheel
9147	Gearbox spring
9658	Bushing (7mm ID, 25mm long)
10118	GREASE ZERK, 6MM STRAIGHT
11456	Locking pin, support stand
11476	Lynch Pin, 9mm Dia.
11476.1	Lynch pin, 9 mm dia w/ chain
11576.2	Toolbar spacer, special hitch
11577	U clamp w/ Bolt
900015.1	Tire and Rim Assembly (5.90x15)
10101012	External Tooth Locking Washer, 12x20
10172066	Roll Pin, 5x35
10172090	Roll Pin, 6x25
10172091	Roll Pin, 6x30
10173020	Roll Pin, 8x40
10530090	Phillips Head Screw, 6x10
10621055	Washer, 13 x 30 x 5
10621056	Washer, 13 x 30 x 6
10621061	Washer, 13 x 40 x 4
10622024	Washer, 16.5 x 26 x 1
10624062	Washer, 36 x 58 x 1.5
10118.a	Grease Zerk, 6mm, 45 degree
1534.a	Counter Clamp, 120mm
2034.d	Clutch spring whl, right
2034.g	Clutch spring whl, left
4306.a	Lower sprocket drive whl, 13T
4307.b	Chain, fixed drive wheel 13N
4309.1b	Slipclutch Sprocket, LH, 13 Tooth (w/ 4310.1a)
4309.2b	Slipclutch Sprocket, RH, 13 Tooth (w/ 4310.2a)
4310.1a	Claw Slipclutch, LH (C12A on casting)
4310.2a	Claw Slipclutch, RH (C12B on casting)
4312.a	Bushing & Spring Clutch (uses 8x12 bolt)
4325.c	Triple sprocket, gearbox (T413B)
4327.a	Gearbox chain- 36 link, w/ 13 N connector link
4467.d	Slipclutch Assembly complete (w/ 4309.2b & 4310.2a)
4467.g	Slipclutch Assembly complete (w/ 4309.1b & 4310.1a)
4504.c	
4506.a	Nut, Nylock, 20 mm
4522.1a	Left support bracket
4522.2a	Right support bracket
4539.b	Turbofan mounting bracket
4656.a	Rear sprocket, 13T, hex bore, takes 8x40 roll pin
4657.a	Chain, 13N (66 links w/ conn link)
4658.a	Drive chain shield
4710.1b	Support frame, w/clutch to the right (since 1994)
4710.2b	Support frame, w/clutch to the left (since 1994)
4909.a	Shaft spacer, MS drive whl blck
4910.1d	Shaft, spec. MS drive whl blck w/ whl right of blck
4910.1g	Shaft, spec MS drive whl blck w/ whl left of blck
4910.d	Shaft, MS drive whl blck / whl right of blck
4910.g	Shaft, MS drive whl blck / whl left of blck
4922.d	Chain shield, special drive whl, RH
4922.g	Chain shield, special drive whl, LH
4923.d	Removable shield on special whl unit
4923.g	Removable shield on special whl unit
AW51812	Rim Only
F38613	Bolt, 8x12
F38705	Bolt, 12x25
F39210	Bolt, 12x50
F40186	Hex Nut, 20mm
G17010615	Tire Only

ADVANCED FRAME ASSEMBLY



PART No.	DESCRIPTION
1534.a	Counter clamp,120 mm
4365.a	Hitch bar, semi-automatic hitch, A12
4366.c	Locking rod for hitch bar
4369	Sleeve, locking rod
4370	Locking spring
4549	Plastic protection cap
4603.a	Hitch, advanced toolbar frame, 2m20
4603.1a	Hitch, advanced toolbar frame, 2m60
4604.1	Support bracket, turbofan, right
4604.2	Support bracket, turbofan, left
4605.a	Guide rod for advanced frame
4606	advanced hitch toolbar, complete
4606.1	Toolbar spacer
4606.2	Toolbar spacer

UP PRESSURE SPRING ASSEMBLY



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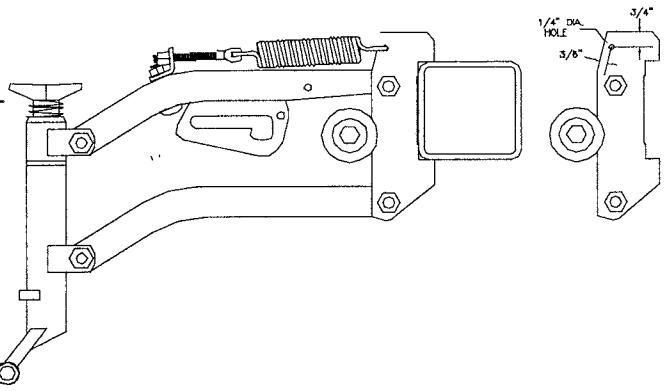
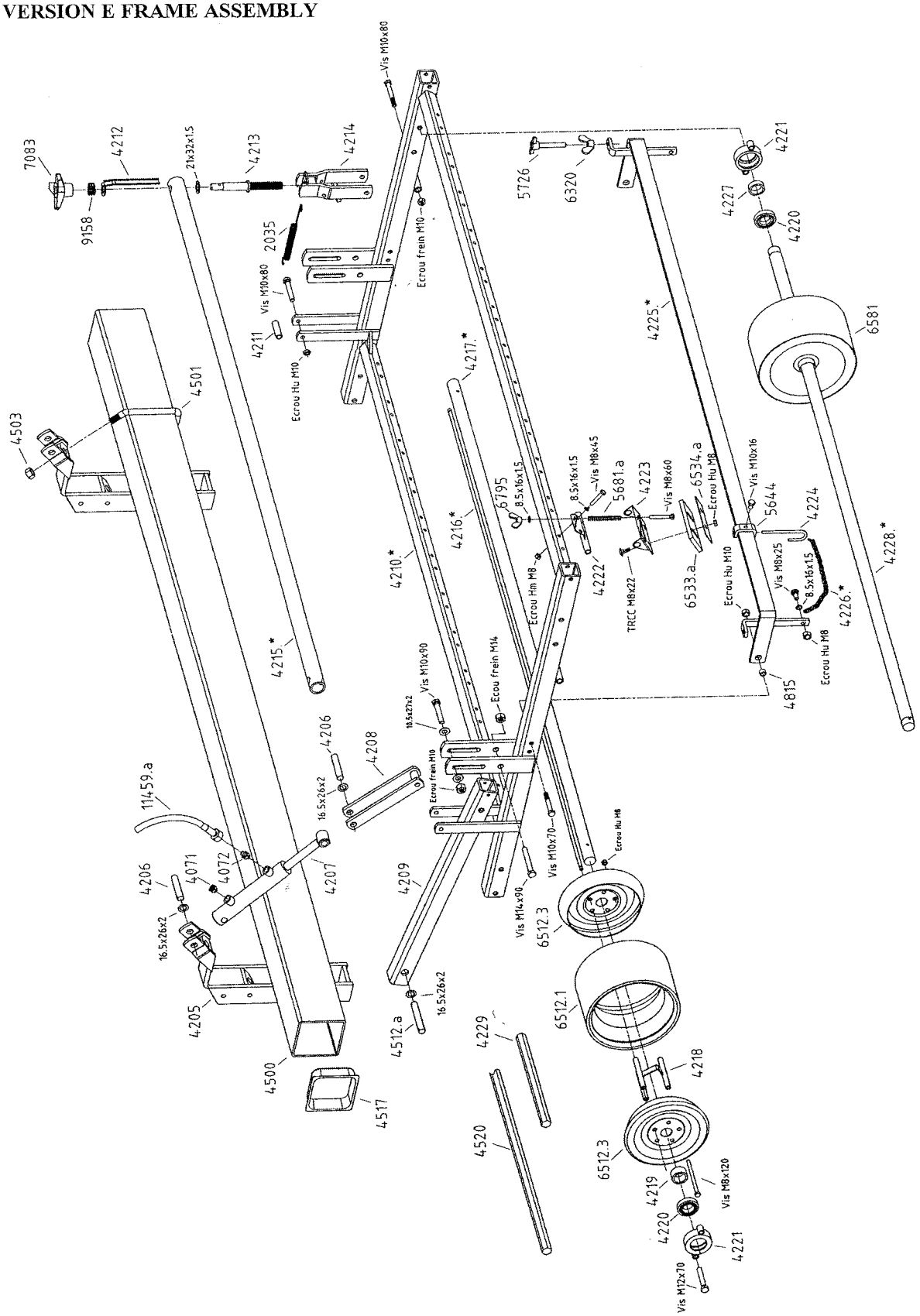
UP PRESSURE SPRING ASSEMBLY



PART No.	DESCRIPTION
651086	Up pressure spring assembly
6525	Up Pressure bracket
7071.1	Tension rod
7033	Spring
CB-4425	Carriage Bolt, 1/2 - 13 x 2 1/2
N-4101	Nylon Locknut, 1/2 - 13
NM-21011	Nut, 10mm

MS Planter

VERSION E FRAME ASSEMBLY



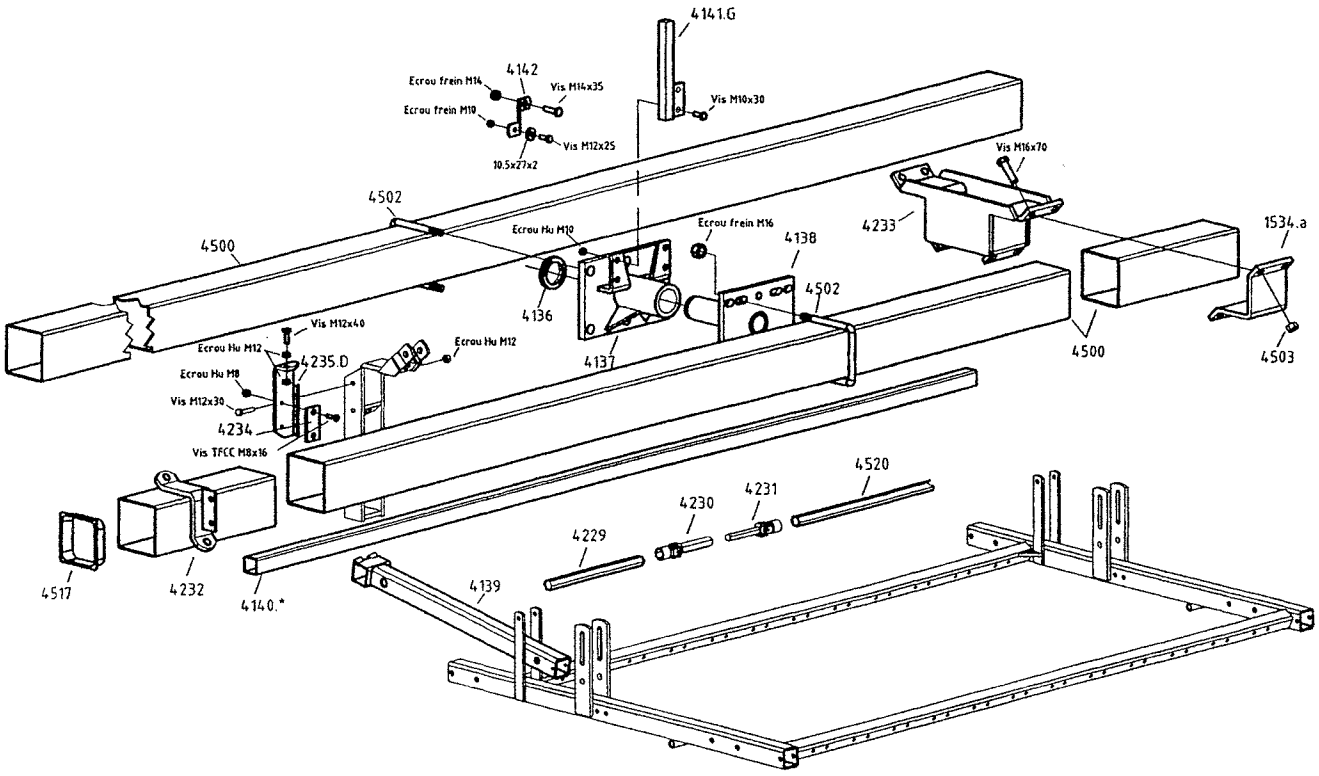
2035	Spring
4071	Breather fitting
4072	Hose connector fitting
4205	Support bracket cylinder
4206	Pins, cylinder
4207	Cylinder
4208	Lift linkage
4209	Stabilizing linkage
4210	Frame for carrying wheels
4211	Spacer
4212	Depth gauge
4213	Screw adjustment rod
4214	Yoke with adjustable nut
4215	Depth adjustment carrier bar
4216	Threaded rod for connecting wheels
4217	Front axle for press wheels
4218	Spacer for wheel rims
4219	Busher spacer, 250x145
4220	Bearing
4221	Bearing housing
4222	Scraper support bracket
4223	Scraper mounting bracket
4224	Hanger bracket, covering chain
4225	Carrier bracket for drag chains
4226	Chain for closing furrow
4227	Bushing spacer for wheel
4228	Rear axle for SS press wheels
4229	Hex shaft for combination wheel block/gearbox
4500	Toolbar, 5"x5"
4501	V bolt, 16mm
4503	Locking nut, 16mm
4512.a	Pin, gearbox roller
4517	Cap toolbar, 5"x5"
4520	Hexagon drive shaft, specify length
4815	Spacer, bushing
5644	Adjustable bracket, covering chain
5681.a	Spring, scraper
5726	Adjusting screw, 12mm
6320	Wing nug, 12mm
6512.1	Tire, 250x145, self cleaning
6512.3	Half rim
6533.a	Greenflex scraper
6534.a	Scraper mounting plate
6581	Stainless steel press wheel
6795	Wing nut, 8mm
7083	Handwheel, depth control
9158	Spring
11459.a	Hydraulic hose

10561055	8x22, bolt
F38616	8x25, bolt
F38620	8x45, bolt
F38623	8x60, bolt
F38631	8x120, bolt
10502012	10x16, bolt
F38664	10x70, bolt
F38666	10x80, bolt
F38667	10x90, bolt
10512054	12x70, bolt
F38748	14x90, bolt

F40307	8mm nut
F40166	10mm nut
F40175	14mm nut

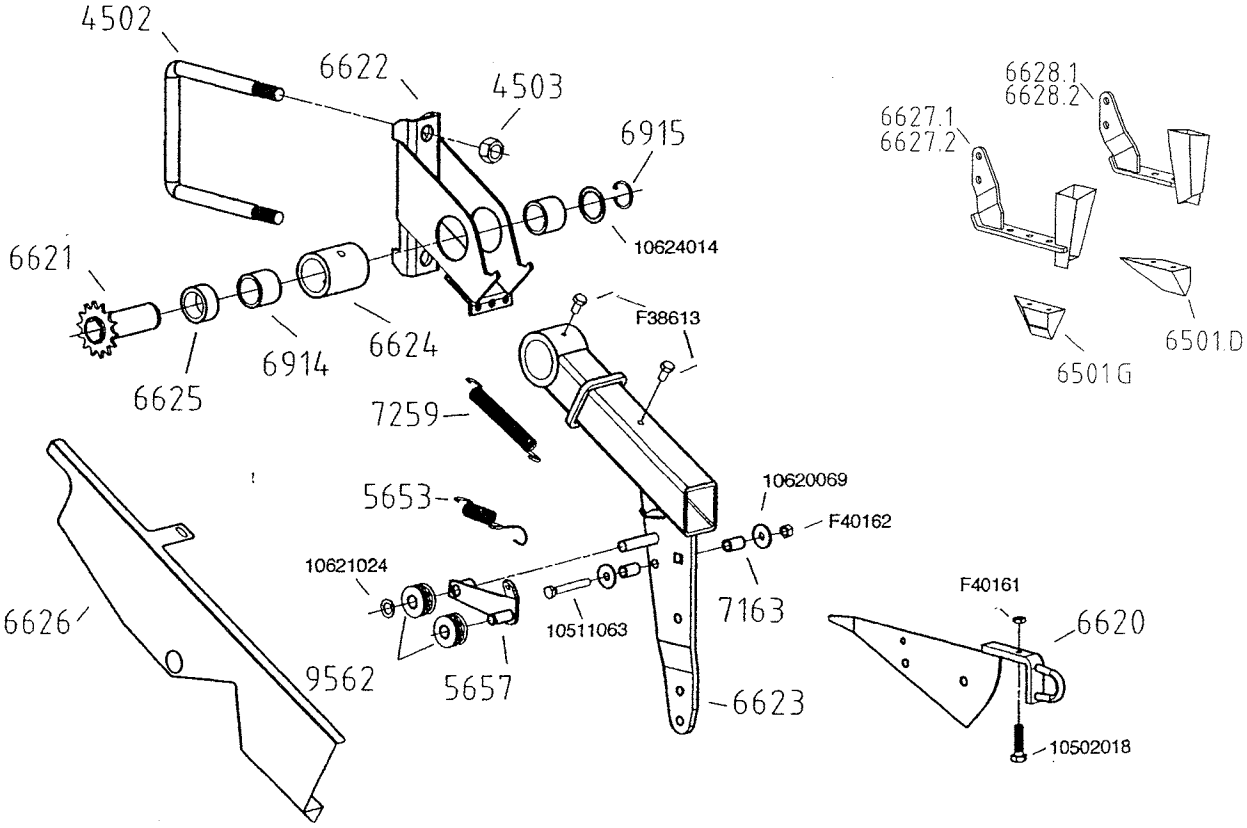
10620063	8.5x16x1.5, washer
10620095	10.5x27x2, washer
10622026	16.5x26x2, washer
10623009	21x32x1.5, washer

PLANTING UNIT FRAME, VERSION E



1534.a	Counter clamp	4502	U bolt, 16mm
4136	Pivot nut, 60mm	4503	Locking nut, 16mm
4137	Front pivot block	4517	Cap toolbar, 5"x5"
4138	Rear pivot block	4520	Hexagon drive shaft, indicate length
4139	Traction tie rod		
4140.1	Torsion bar: 1880	8mm nut	
4140.2	Torsion bar: 1740	12mm nut	
4140.3	Torsion bar: 1600	14mm nut	
4140.4	Torsion bar: 1460	10mm nut	
4140.5	Torsion bar: 1320	16mm nut	
4141.D	Turbofan support bracket, right		
4141.G	Turbofan support bracket, left	8x16	
4142	Turbofan strap	10x30	
4229	Hex shaft, 320mm	12x25	
4230	Flex joint, female	12x30	
4231	Flex joint, male	12x40	
4232	Support bearing	14x35	
4233	Lateral spacer	16x70	
4234	Stop plate		
4235.D	Stop, right	10.5x27x2	
4235.G	Stop, left		
4500	Toolbar, 5"x5"		

PLANTING UNIT FRAME, VERSION E



4502	U bolt, 16mm
4503	Locking nut, 16mm
5653	Tension spring
5657	Chain Tension Bracket
6501.D	Right hand shoe point
6501.G	Left hand shoe point
6620	Bracket
6621	Sprocket shaft
6622	Bracket
6623	Bracket
6624	Main cylinder
6625	Spacer
6627.1	Left shoe - standard 50-90mm
6627.2	Left shoe - large 90-120mm
6628.1	Right shoe - standard 50-90mm
6628.2	Right shoe - large 90-120mm
6914	Self lubricating bushing
6915	Snapring
7163	Bushing
7259	Spring
9562	Chain roller

10620069	8.5X20X1.5 washer
10621024	13x18x1.5 washer
10624014	31x41x1washer

F40162	8 mm nut
F40161	10mm jam
F38613	8x12 bolt
10511063	8x60 bolt
10502018	10x35 bolt

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Three different assemblies are possible for the gearbox.

1. Standard, Central assembly: Normal assembly for planters with an even number of rows (4, 6, 8...) and inter-row spacing of 14" or more.

2. Standard, Offset assembly: For planters with an odd number of rows (5, 7, 9...) and inter-row spacing of more than 14".

3. Combination Wheel Block Assembly: For planters with row spacing less than 14". See figure 23.

SETTING

Standard, Central assembly and Offset assembly
The standard spacing gearbox is shown in Fig. 22. The standard gearbox consists of a changeable upper cluster fitted with 6 sprockets (two 3-sprocket clusters) and a lower fixed 3-sprocket cluster. This allows for 16 different gear ratios. The following gearbox chart indicates the distances possible for each distribution disc. A decal placed on the planter will provide the same information for on-the-spot reference.

To change the seed spacing, push the idler lever (1), lock its pawl (2) then align to the proper sprocket combination. The small upper sprocket cluster is fitted with a bolt, (3), which should be tightened to avoid any sliding of the cluster.

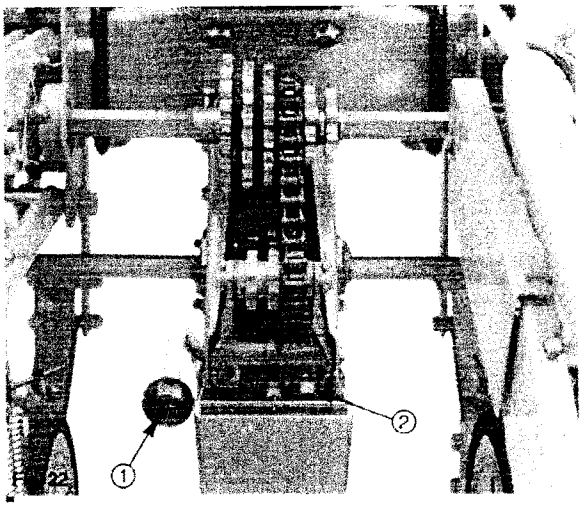


Fig 22

Combination, Narrow spacing
Each drive wheel block is furnished with an upper 6-sprocket gear cluster and 3 interchangeable drive sprockets: 16 gear are possible.
To change sowing distance, first select the desired spacing from the gearbox chart on the following page. Using the indicated sprocket at the top of the column, take the A, B, or C drive sprocket from its storage place and position it at (3). Align the drive sprocket carefully to the selected sprocket in the cluster (4) before tightening its screw.

The two unused drive sprockets (3) can be stored at the end of the shaft (5).

NOTE: Make sure to use the same sprocket setting on both drive wheel blocks.

NOTE: Position the sprockets as shown on the following gearbox chart. Check that the gearbox lever, its lock and the roller are in good working order.

Poor alignment of the sprockets and stiffness of the chain will cause premature wear of the sprockets. Use chain oil preferably to regular oil for proper lubrication.

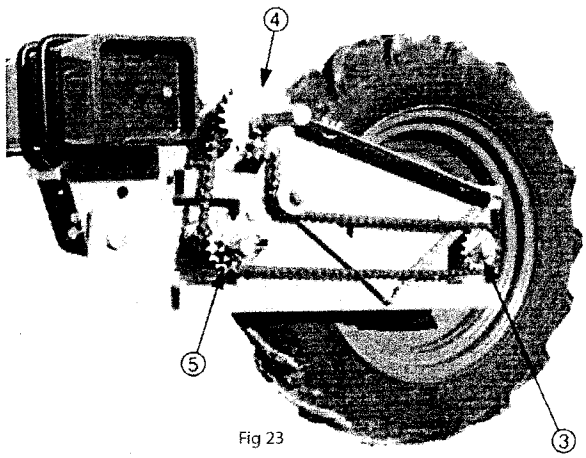
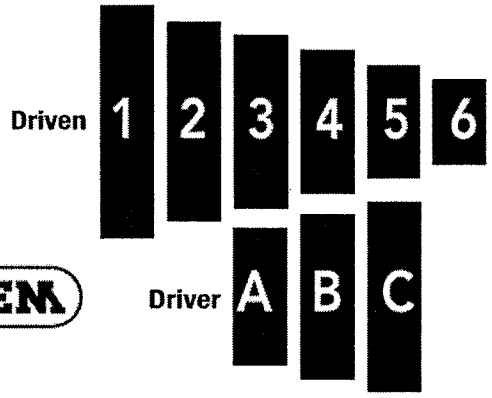


Fig 23

MS Mini Seed Planter

SOWING DISTANCES

Planting Distances



MONOSEM

Type MS

USE FOR DRIVE WHEEL TIRE SIZE 5.90x15

Seed Disc Holes			C 6	C 5	B 6	C 4	B 4	A 5	C 3	A 4	C 2	B 3	C 1	B 2	A 3	B 1	A 2	A 1
18	in.		5 1/8	5 5/8	5 7/8	6 5/8	7 3/4	7 7/8	8 5/8	9 1/4	9 5/8	10 1/8	10 5/8	11 1/4	12 1/8	12 3/8	13 1/2	14 7/8
	cm		13.0	14.0	15.0	17.0	19.5	20.0	22.0	23.5	24.5	25.5	27.0	28.5	30.5	31.5	34.5	38.0
30	in.		3	3 3/8	3 1/2	4	4 5/8	4 3/4	5 1/8	5 1/2	5 3/4	6	6 3/8	6 3/4	7 1/4	7 1/2	8 1/8	9
	cm		7.5	8.5	9.0	10.0	11.5	12.0	13.0	14.0	14.5	15.5	16.0	17.0	18.5	19.0	20.5	22.5
36	in.		2 1/2	2 3/4	3	3 1/4	3 7/8	3 7/8	4 3/8	4 5/8	4 7/8	5	5 3/8	5 5/8	6	6 1/4	6 3/4	7 1/2
	cm		6.0	7.0	7.5	8.5	10.0	10.0	11.0	11.5	12.0	13.0	13.5	14.5	15.5	16.0	17.0	19.0
60	in.		1 1/2	1 5/8	1 3/4	2	2 1/4	2 3/8	2 5/8	2 3/4	2 7/8	3	3 1/4	3 3/8	3 5/8	3 3/4	4	4 1/2
	cm		4.0	4.5	4.5	5.0	6.0	6.0	6.5	7.0	7.5	7.5	8.0	8.5	9.0	9.5	10.5	11.5
72	in.		1 1/4	1 3/8		1 5/8		2	2 1/8		2 3/8	2 1/2		2 3/4	3	3 1/8	3 3/8	3 3/4
	cm		3.0	3.5		4.0		5.0	5.5		6.0	6.5		7.0	7.5	8.0	8.5	9.5
120	in.		3/4		7/8	1		1 3/16	1 5/16		1 7/16	1 1/2	1 5/8	1 11/16	1 13/16	1 7/8	2	2 1/4
	cm		2.0		2.2	2.6		3.0	3.2		3.6	3.8	4.0	4.2	4.6	4.8	5.2	5.6
180	in.		1/2		9/16		3/4		7/8		15/16	1		1 1/8	1 3/16	1 1/4	1 3/8	1 1/2
	cm		1.2		1.6		2.0		2.2		2.4	2.6		2.8	3.0	3.2	3.4	3.8

v. 09.08 part # st0221

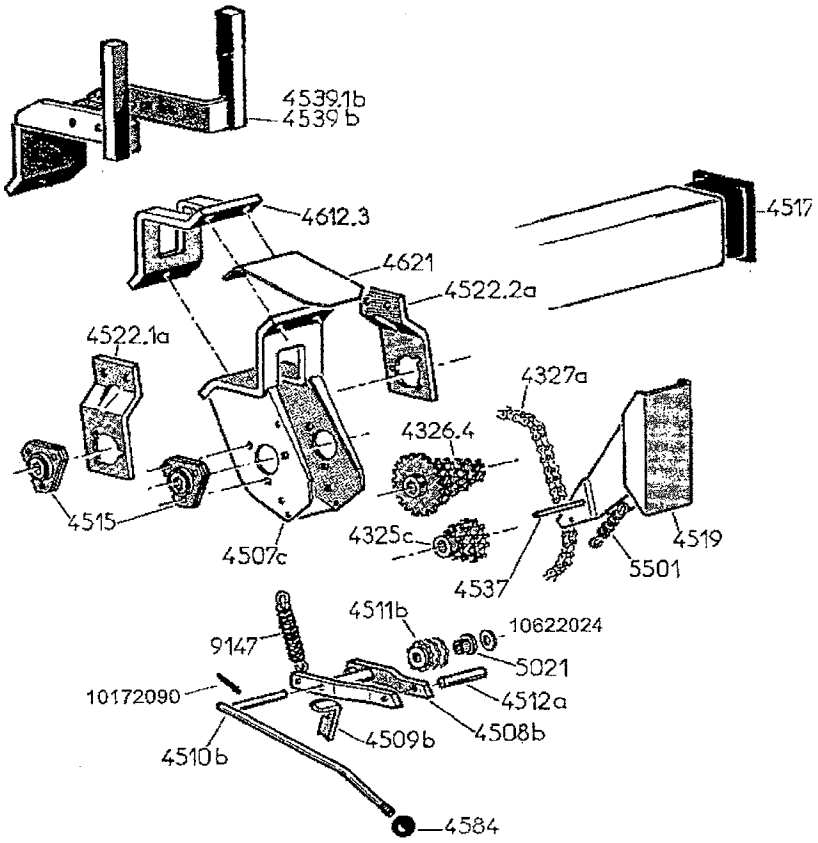
These planting distances were obtained with a standard assembly and sprocket system. Additional settings are possible by using different combinations or special sprockets. Consult Monosem for nonstandard requirements. Important: Poor alignment of the sprockets of the seed spacing gearbox and stiffness of the chain will cause premature side wear on the pinions. Make sure the chains are tight and properly lubricated, and the tires are properly inflated. The indicated spacings are theoretical and may vary from 5-10% depending on soil conditions.

IMPORTANT! As of July 2008, The Tire on the Drive Wheel is 5.90 x 15.
Prior to July 2008, The Tire on the Drive Wheel was 5 x 15.
The size of the tire affects the planting distances.

The chart shown above reflects seed distances for the newer wheel, 5.9 x 15. This change is in effect as of July 2008.
Prior to July 2008 the planters had a drive wheel of 5 x 15.
To use the old chart (pre July 2008) with new tire (5.9 x 15), multiply distance on old chart by 1.07
To use the new chart (post July 2008) with old tire (5 x 15), divide distance on new chart (above) by 1.07

MS Mini Seed Planter

ASSEMBLY



PART No.	DESCRIPTION
4325.c	Lower Three Sprocket Cluster (10-12-14 Tooth)
4326.4	Standard 6-Tooth Upper Sprocket Cluster (10-11-13-17-19-21 Tooth)
4327.a	Drive Chain (13N, 36 links w/conn. Link)
4507.c	Gearbox Housing
4508.b	Chain Idler support frame
4509.b	Lever Lock
4510.b	Gearbox Handle
4511.b	Chain Tightener Roller (with 5021 Bushing)
4512.a	Pin
4515	Bearing Complete with Flangettes
4515.1	Bearing Only (205KRRB2, 7/8 Hex Bore)
4515.2	Flangettes (2) (3 bolt hole)
4517	Toolbar cap
4519	Gearbox Door
4522.1a	Left Support Bracket (for Hex Shaft)
4522.2a	Right Support Bracket (for Hex Shaft)
4537	Pin for Gearbox Door
4539.1b	Gearbox Mounting Bracket without Turbofan Stand
4539.b	Gearbox Mounting Bracket with Turbofan Stand
4584	Knob for Handle
4612.3	Counter clamp
4621	Shield, Gearbox

PART No.	DESCRIPTION
5021	Bushing (Self Lubricating, B25)
5501	Spring, Gearbox Door
9147	Spring, for Tightening Drive Chain
10172090	Roll pin, 6 x 25
10502012	Bolt, 10 x 15 (to secure sprocket cluster)
10622024	Washer, 16.5 x 26 x 1

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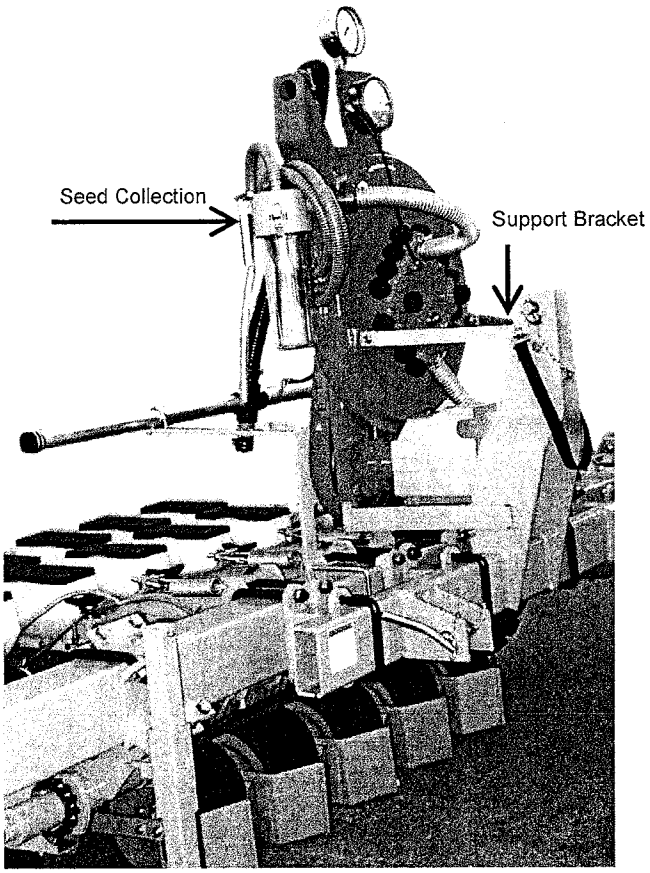
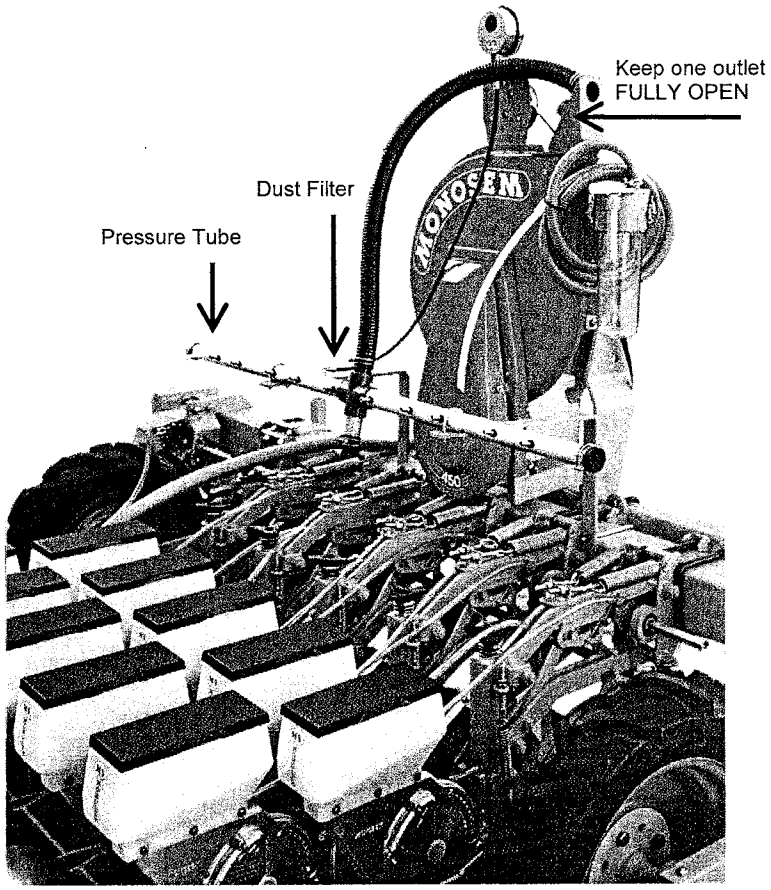




STANDARD TURBOFAN

The standard turbofan used for a Mini Seed planter is a 540 rpm. A special pump pulley is available as optional equipment for the 450 and 1000 turbofans. It is recommended to use a 450 rpm turbofan when using a hydraulic drive.

The turbofan is equipped with a 16 outlet manifold with an adjustable air shutter.
TO OBTAIN SUFFICIENT AIR AND PRESSURE, THE SHUTTER MUST BE FULLY OPEN.

The vacuum hose is attached to the outlets on the back of the turbofan and they deliver suction to the metering box of each unit. An arrow decal sticker on the back of the turbofan indicates that the turbofan blade runs in a counter clockwise direction. A protection shield against the rain is located at the top of the turbofan, and when in a raised position, indicates that the turbofan is operating.

Note: Before planting, make sure that the support brackets are tightly secured to the frame to eliminate any vibrations of the turbofan.

A vacuum gauge may also be mounted to the turbofan.

ATTENTION: The feeder manifold has 2 outlets. One is to be used to connect the air pressure tube. The other one, however MUST ABSOLUTELY REMAIN FREE AND OPEN

PTO (Power Take Off)
The PTO connects the tractor to the turbofan.

Make sure you connect the proper end of the PTO to the tractor. An arrow on the PTO indicates the end that is attached to the tractor.

The following warning is placed on your PTO shaft for your safety.

DANGER Rotating drive line contact can cause death – keep away. Do not operate without all driveline, tractor and equipment shields in place, without drivelines securely attached at both ends, and without driveline shields that turn freely on driveline.

MS Mini Seed Planter

SECONDARY AIR SYSTEM

The turbofan is also equipped with a secondary air system consisting of an air feeder manifold and an air pressure tube. This system feeds pressurized air to the base of each metering unit. A nozzle blows air against the back side of the seed disc in order to clean out any plugged holes of light and sharp pointed seeds. The pressure tube is provided with a filter whose purpose is to catch any dust blown through the system. This particle trap should be filled with about 1 ¼" of oil.

NOTE: Inspect the filter daily and service as needed, especially in dusty conditions.

Only use the secondary air system for seeds whose holes are smaller than 1.2mm. It is indispensable when planting small sized and light seeds (carrot, lettuce, endive...) however it becomes useless when planting with bigger seed such as cabbage or coated seed. When planting with bigger seed, it is necessary to disconnect or remove the feeder manifold and close the shutter so that the turbofan gives the maximum air vacuum.

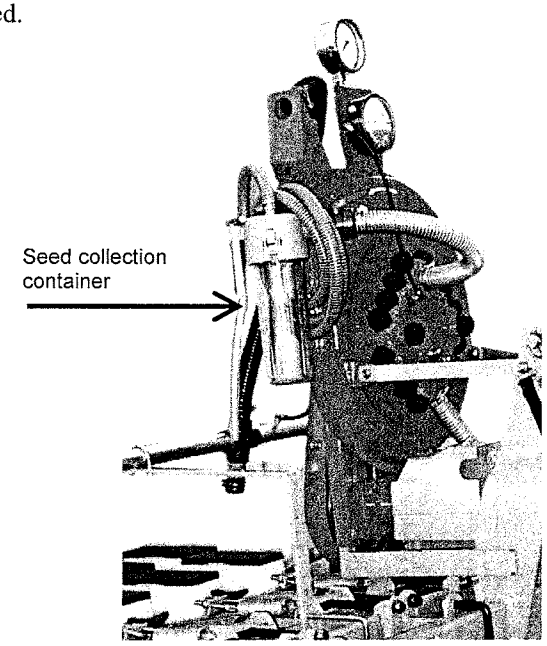
IMPORTANT: To achieve a good distribution with a vacuum planter, it is necessary to use top quality, properly sized, clean seed.

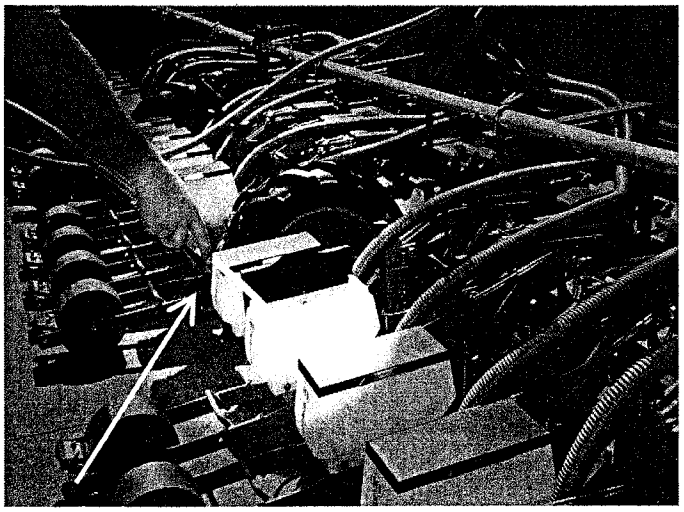
If you are using seed lots containing dust and impurities, the secondary air system will not be sufficient for cleaning the seed holes, the discs will have to be checked more often

VACUUM SEED EMPTYING SYSTEM

The seed collection container is mounted to the turbofan by means of a mounting bracket and is connected to one of the outlets of the manifold. To suck out the remaining seeds of each hopper and the seed meter, simply insert the flexible hose into the bottom of the hoppers and meter. The suction unit of the turbofan will collect the seed in the plastic collection container.

IMPORTANT: Empty the container by untightening its 2 clips as soon as it is half full to avoid the seed being sucked into the turbofan, especially with light seed.





Use Flexible hose attached to seed collection container to clean out hoppers

MS Mini Seed Planter

OPTIONAL HYDRAULIC DRIVE

An optional hydraulic drive for the turbofan is available. If a hydraulic drive is used, it is recommended to use a 450 rpm turbofan. You must then double check that there is adequate oil flow for the turbofan to run at 450 rpm. Use an rpm gauge to check, placing it at the center of the lower pulley.
A vacuum gauge may also be mounted to the turbofan. (The vacuum gauge is standard equipment when ordering the hydraulic drive.) Vacuum settings for Hydraulic Drive shown below in inches of water column.

Carrots (Raw)	10 – 12"
Onions (Raw)	10 – 12"
Lettuce (Raw)	10 – 12"
Lettuce (Pelleted)	15 – 17"
Broccoli	10 – 12"

Mounting Hydraulic Drive on a 450 Turbofan Single Mounted Toolbar

Tools needed:
13-17-19-22-30 mm wrench or socket
11/16 wrench or socket
5/32 Allen wrench

The desired vacuum is dependent on the correct amount of oil flow to the hydraulic motor. Starving the motor of oil will cause the vacuum to drop. An excessive amount of oil flowing into the motor can result in damage to the motor or the fan blade. When attempting to shut off the turbofan the blade must be allowed to "wind down" slowly. If the flow of oil stops abruptly, the bypass block on the motor will recirculate the oil already in the motor helping to prevent damage to the blade and motor. Still, you should not allow the flow of oil to stop suddenly. This is accomplished with the tractor's hydraulic controls. Refer to your tractor's operators manual for further information.

Controlling oil flow to the motor can be done in one of two ways:

1. with the flow control valve included with the hydraulic motor
2. with the tractor hydraulic system controls.

If your tractor has flow control capabilities, then it is recommended that you use this method and remove the in-line flow control valve. Failure to do this will cause the hydraulic oil to overheat, damaging the motor.

Oil requirements are as follows:
Regular & high output turbofan -
6 to 7 gallons per minute
Extra high output turbofan -
7 to 8 gallons per minute

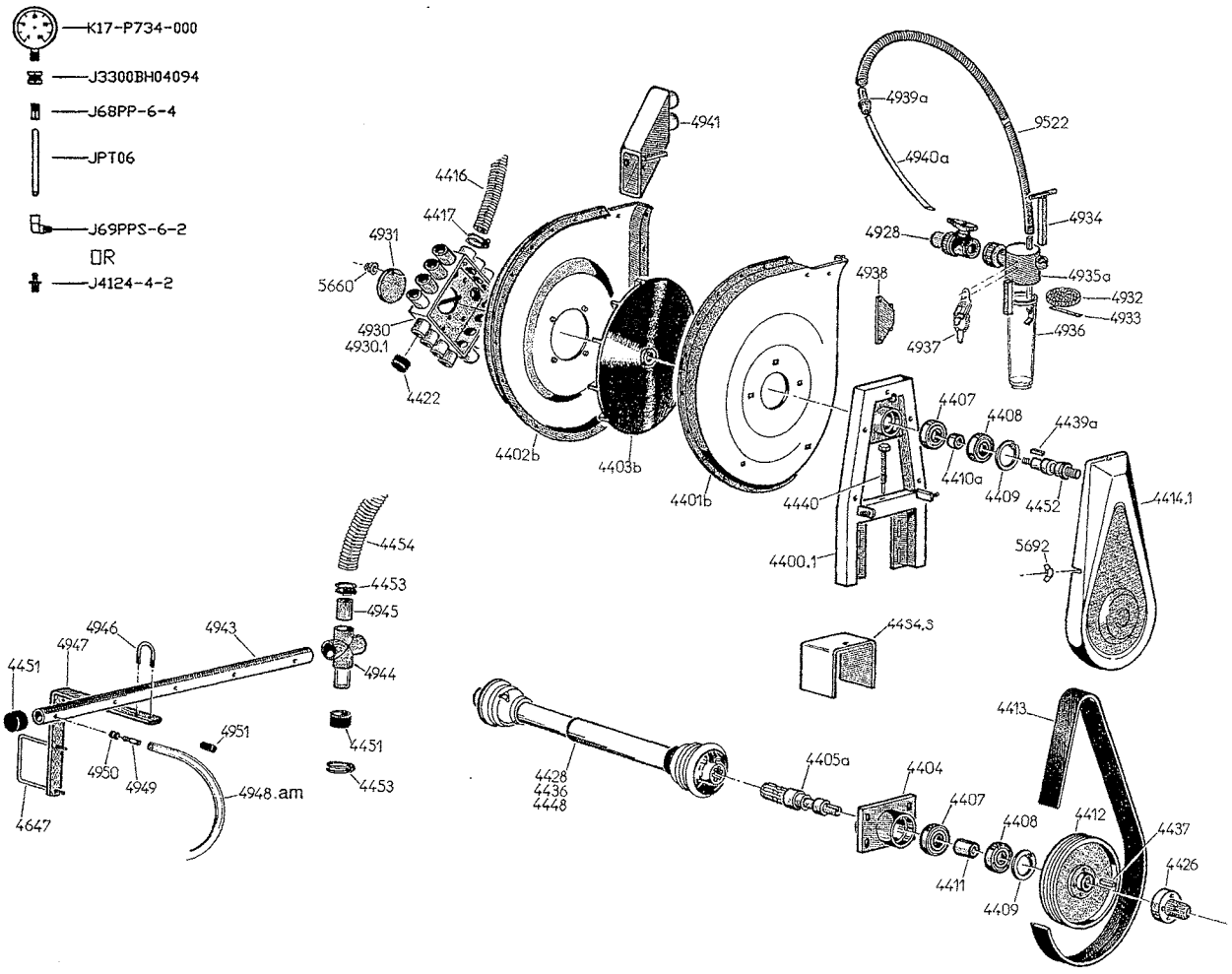
To set the vacuum level:

1. See operator's manual for recommended vacuum settings or consult your local dealer.
2. Push tractor lever/switch to start oil flow to hydraulically driven turbofan and let oil warm up.
3. With some seed in the hoppers, turn drive wheels by hand or lower planter to engage drive wheels and drive forward a short distance to fill cells on seed discs with seed. This will result in a more accurate setting of the vacuum.
4. Readjust the oil flow, if necessary, until the desired vacuum level is obtained on the vacuum gauge.
5. It is not necessary to have to reset vacuum levels daily. Vacuum levels will be slightly lower during tractor and pump start up.

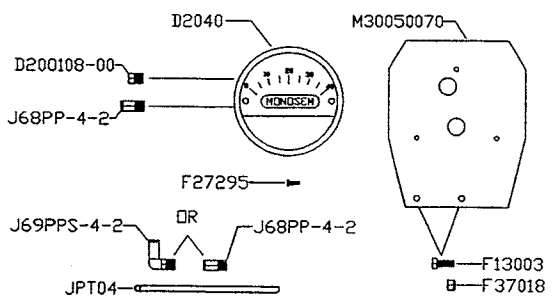
MS Mini Seed Planter

STANDARD TURBOFAN ASSEMBLY

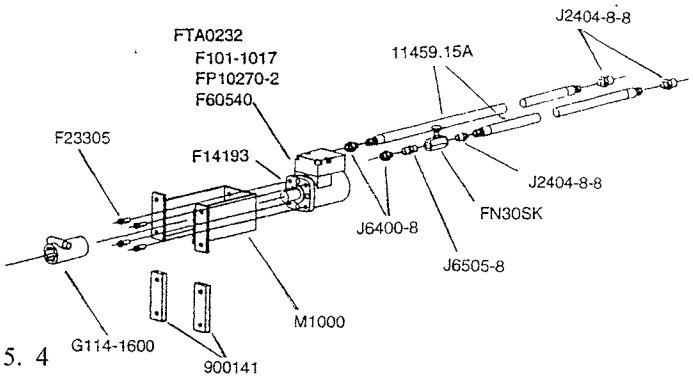
2041.asy Secondary Air Pressure System Gauge Assembly



Turbofan Vacuum Gauge Assembly



HYDRAULIC DRIVE
F1017VMT



MS Mini Seed Planter

STANDARD TURBOFAN ASSEMBLY

4400.1	Turbofan support frame
4401.b	Turbofan housing, drive belt side
4402.b	Turbofan housing, manifold side
4403.b	Turbofan wheel
4404	Turbofan support bracket
4405.a	Spindle with adaptor (A230A)
4407	Bearing 62 mm (62062RS)
4408	Bearing 72 mm (63062RS)
4409	Snapring (large) (72T)
4410.a	Bushing for upper shaft
4411	Bushing
4412	Pulley - 450/540 RPM (S193)
4412.3	Pulley -1000 RPM
4413	Pulley belt -450/540 RPM
4413.1	Pulley belt - 1000 RPM (1168J19/1)
4414.1	Cover shield
4416	Vacuum hose for PNU, MS
4416.130	Hose, length 1 m 3
4416.200	Hose, length 2 m
4416.285	Hose, length 2 m 85
4417	Hose clamp
4422	Plastic cap (C37)
4426	Pump pulley
4428.B	PTO shaft complete, Bondioli
4428.W	PTO shaft complete, Walterscheid
4428.B21	PTO shaft complete, 1000, 21 spline, 24" Bondioli
4428.W21	PTO shaft complete, 1000, 21 spline, 24" Walterscheid
4429.a	Outlet shield
4434.3	Safety shield
4437	Key, lower shaft, 8x7x40
4439.a	Key, upper shaft, 6x6x45
4440	Belt for adjustable belt tension
4451	Plastic cap
4452	Upper spindle, turbofan
4452.1	Shaft 450 RPM
4453	Hose clamp
4454	Vacuum hose, black, specify length
4647	U-bolt (12 mm)
4930	Manifold, 18 outlet, MS
4931	Rotating shutter, manifold
4930.1	
4932	Filter
4933	Filter clip
4935.a	Canister lid
4936	Canister
4937	Spring latch
4938	Mounting bracket, air clean out
4939.a	Tube connector
4940	Clean-out tube
4941	Upper collector, MS turbofan
4942	Tube end
4943	MS secondary-air tube, specify length
4944.1	Connector, secondary-air
4945	Connector extension
4946	U clamp, secondary air
4947	Support bracket, secondary air
4948.am	Transparent air tube
4949	Tube end cap
4950	Grommet
4951	End , diameter 10
5660	Tapered spring
5692	Wing nut, 10mm
9522	Hose, microsem, ms

D2040.asy	Vacuum gauge complete w/mounting bracket & hardware
D2040	Vacuum gauge only
D200108-00	Filter vent plug
F13003	1/4-20 x 3/4 Z5 (use 2)
F37018	Nylock 1/4-20 lock nut (use 2)
J68PP-4-2	Poly-push fitting
J69PPS-4-2	Poly-push swivel fitting
JPT04	Tubing, 1/4" PE
M30050070	Vacuum gauge mounting plate

2041.asy	Secondary air system gauge complete
K17-P734-000	Pressure gauge
J3300BH04094	Bulkhead connector
J68PP-6-4	Hose end
JPT06	3/8" tubing
J69PPS-6-2	Poly push swivel fitting
J4124-4-2	Blow off fitting NPT pushlock
Hydraulic Drive	
F1758-VMT	Hydraulic drive w/manifold & vacuum gauge complete
11459.15A	Hydraulic hose assembly
FTA0232	Hydraulic motor complete with bypass block
F101-1017	Hydraulic motor only
FP10270-2	Bypass block only w/hardware
F14193	Woodruf key
F60540	Seal kit
FN30SK	Flow control valve 1/2" NPT
F221461	Z16-14x2 carriage bolt
F23305	3/8-16x1 Socket head cap screw
F33624	7/16 lock washer
F36108	7/16-14 hex nut
G114-1600	Spline adapter
J2404-8	Hydraulic fitting
J6400-8	Hydraulic fitting
J6505-8	Hydraulic fitting
M1000	Hydraulic motor bracket
900141	Spacers for standard turbofan

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5. DRIVE

6. ROW UNIT

7. OPTIONAL EQUIPMENT

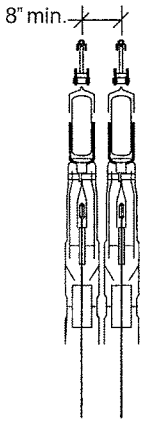
MS Mini Seed Planter

Threre are 5 versions of the Mini Seed row unit available in single or twin line. Row Unit Ver. **A**, **B**, **C**, **D**, & **E** are shown on the following pages with standard features. Other options are available for specific conditions or uses.

PLANTER UNIT Ver.A

Min. 8" (20cm) spacing between units

Ver. **A** is suitable for the majority of planting in narrow seed lines.

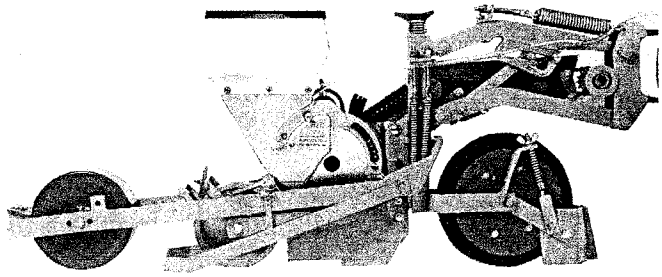


Standard features:

- Clod remover on wheel bracket, quick adjust
- Front rubber press wheel (4½"x 12")
- Rear stainless steel press wheel (4"x 8").
- Narrow shoe with cast point and regular wings
- Narrow intermediate stainless steel press wheel
- Intermediate hillers for closing the furrow
- 3 L plastic hopper
- Up pressure spring

Options available:

- For planting in bands of $2^{2/3"}$ (65mm), the standard shoe and the intermediate press wheel are replaced by a wide shoe and wide intermediate press wheel.

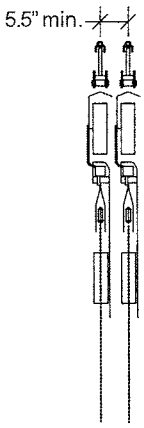


- Rubber rear press wheel (5½"x 10")
- Rear cage press wheel (4½"x 10") with or without rubber tire
- Wider rear cage press wheel (6½"x 10") without rubber tire
- Stainless steel rear press wheel (4"x 8")
- Flat front or rear stainless steel press wheel (4" x 10")
- Concave cast iron wheel with or without rubber tire **(important: the concave cast iron press wheels are used without the intermediate hillers)**
- Narrow intermediate press wheel with rubber tire
- Stainless Steel intermediate wheel
- 1.5 liter metal hopper

PLANTER UNIT Ver. B

Min. 5½" (14cm) spacing between units

This is a simplified planter unit without the intermediate press wheel.

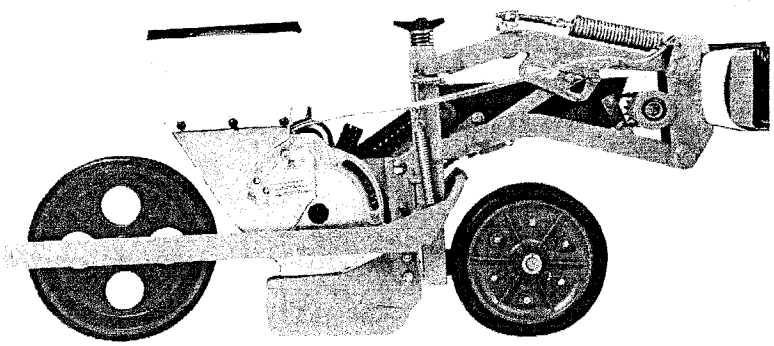


Standard features:

- Front rubber press wheel (2"x 12")
- A cast iron concave press wheel w/ rubber tire.
- 3 L plastic hopper
- Narrow shoe with cast point and regular wings
- Quick adjust clod remover
- Up pressure spring

Options available:

- Special shoe with short point for shallow planting
- 2" – 4" shoe
- 1.5 liter metal hopper

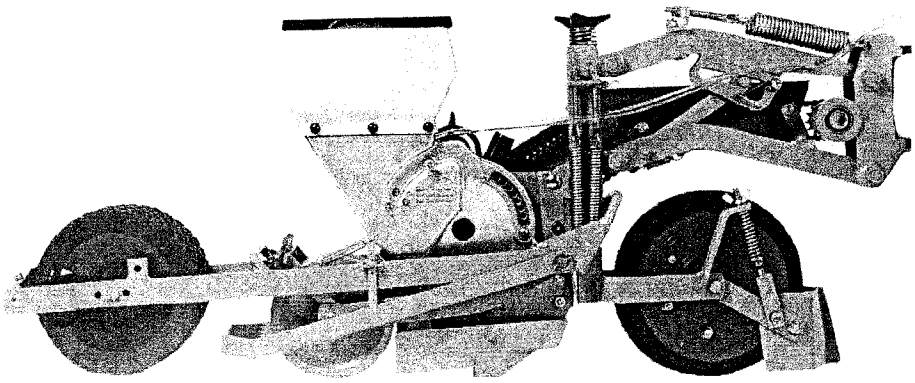


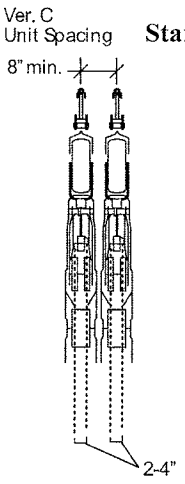
MS Mini Seed Planter

PLANTER UNIT Ver. C

Min. 8" (20cm) spacing between units
Twin line unit, 2"- 4" between seed lines in the row

Ver. **C** is similar to Ver. **A**, but **C** is suited to sowing double rows in well prepared soils (no clods or stones).





Standard features:

- A double tipped shoe which traces two furrows 2" or $2^{3/4}$" (7cm) apart
- Front rubber press wheel (4½"x12" or 5½x10")
- Back cage press wheel, can be equipped with a tire. Together, this wheel and the intermediate hillers close the furrows.
- Intermediate hillers
  - Double intermediate press wheel.
- A small extra clod remover that limits the soil coming up between the shoe tips, it should be precisley positioned.
- 3 L plastic hopper
- Metering box is equipped with a disc that has a double line of holes and a special extra scraper.

(See Metering Box on Ver. **C**)

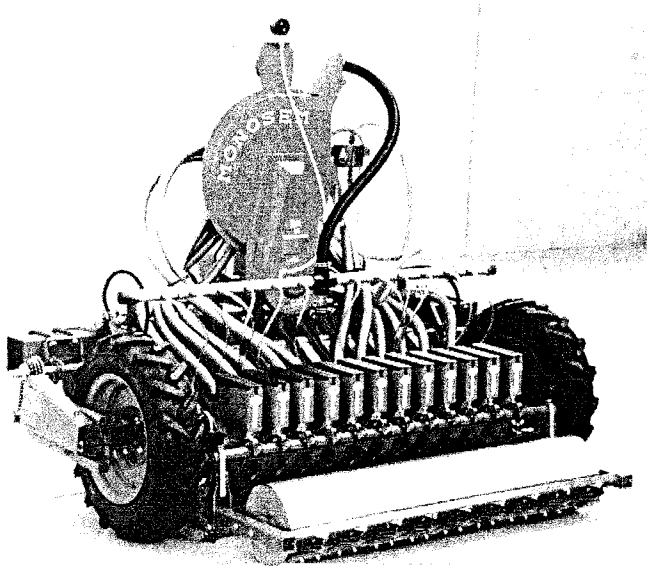
Options available:

- Rubber rear press wheel (5½"x 10")
- Rear cage press wheel (4½"x 10") with or without rubber tire
- Stainless steel rear press wheel (4"x 8") -
- Flat front of rear stainless steel press wheel (4" x 10")
- Wide flat front or rear stainless steel press wheel (5½" x 10")
- 1.5 liter metal hopper
- For planting in bands of 2½"- 4" (65mm-100mm), replace the standard shoe and the intermediate press wheel with a wide shoe and wide intermediate press wheel.

PLANTER UNIT Ver. E

For seed bed planting- multiple lines of narrow row spacing.
Single or Twin line – 2"- 8" between seed lines

Units are assembled within a fixed frame with standard front rubber and rear stainless steel rollers. This planter is ideal for crops requiring multiple lines of close spacing such as baby lettuce, spinach, carrots, etc. Down pressure of both rollers can be regulated hydraulically. Additional frame styles available including a floating frame to follow the side to side contours of the bed



Ver. E ADJUSTMENTS

Before starting planting,

- Adjust the wheel units according to the height of the seed bed.
- Lower the frame until the wheels touch the ground.
- While moving forward, lower the metering units using the hydraulic cylinder

MS Mini Seed Planter

PLANTER UNIT Ver. D
Min 10" spacing between units
Multiple combinations, 3" – 4½" between seed lines

The Ver. **D** unit consists of two offset metering boxes within one unit frame. Allows for one or two seed lines per metering box, or a combination of 2, 3 or 4 seed lines within one unit frame. Adjust the row spacing between the lines by loosening the set screws and sliding the metering boxes on hex shaft as needed. Ver. **D** is ideal for crops that are planted in double lines such as onions. The staggered metering boxes and shoes allow small amounts of trash and clods to flow through easily.

The adjustments on the metering system are the same as for versions **A** & **B**.

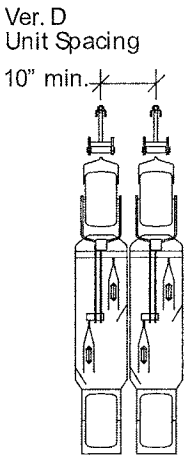
Standard features:

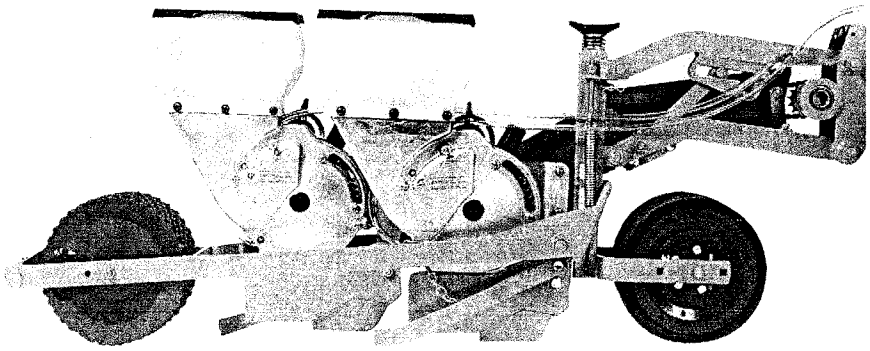
- Rubber front press wheel (6½'x 10")
- Rear cage wheel without tire (6½'x 10")
- Clod remover on wheel bracket, quick adjust

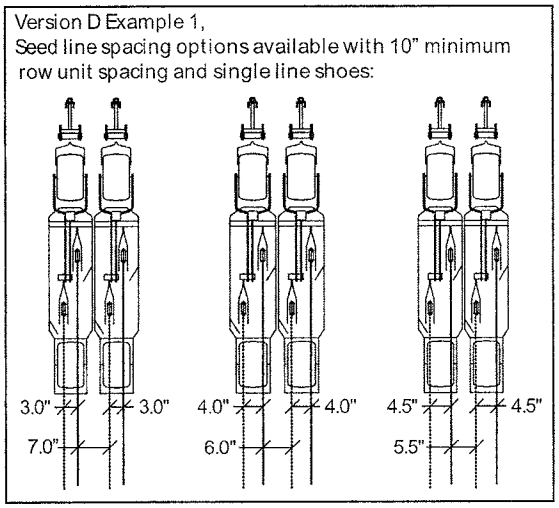
Narrow shoe and a set of hillers for closing the furrow

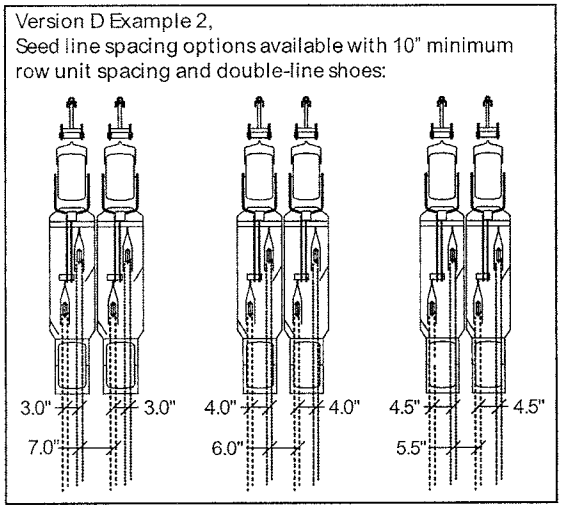
Options available:

- Rubber rear press wheel (6½"x 10")
- Flat front of rear stainless steel press wheel (6½"x 10")
- 1.5 liter metal hopper



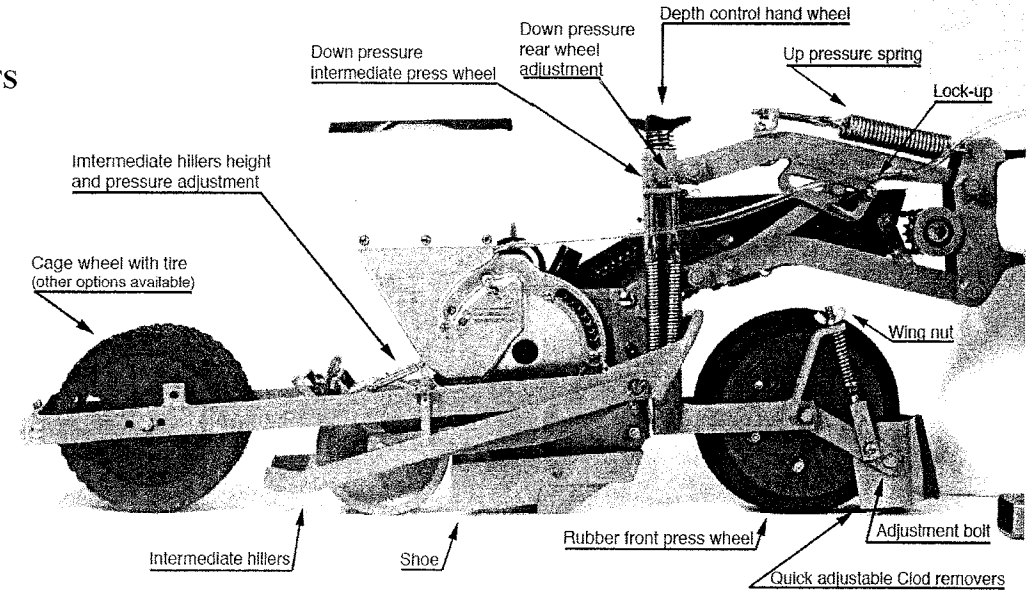






MS Mini Seed Planter

MAIN ADJUSTMENTS



CLOD REMOVERS

To Adjust the height of the clod removers turn the wing nut. To straighten them up turn the adjustment bolt. Use care when adjusting the clod removers. The function of the clod removers is to clear the surface of the soil, but not plow a furrow. It is rigid and mounted in front of the disc openers that push clods away in preparation for the seed trench. The front brace of the clod remover is an independent adjustable opening knife that is used to slice open hard soil and move stones away from the track of the disc opener. The clod remover should be adjusted according to soil type. In rocky soil clod removers may create clogging or blocking. Use a flexible support bracket for the clod remover in rocky conditions.

SEED DEPTH

Adjust the seed depth by turning the depth control hand wheel. Turning the knob changes the height of the front wheels in relation to the disc openers. A sticker close to the hand wheel, indicating a gradual scale, ensures the uniformity of the depth control on all row units of the planter. Be sure that all row units of the planter are set at the same adjustment.

The disc openers and ground adjustment system guarantees an accurate and regular seed depth in all types of soil and conditions because the depth wheels are positioned perpendicular to the falling point of seeds.

INTERMEDIATE PRESS WHEEL

To adjust the down pressure on the intermediate press wheel turn the bolt.

REAR WHEELS

To adjust the down pressure on the rear wheel turn the bolt. Down pressure on the rear wheel regulates the balance between the front and rear wheels (the stability of the planter unit), the regularity and the depth.

INTERMEDIATE HILLERS

Adjust the height and pressure of the intermediate hillers. Unhook the springs if necessary. Works with the shoe to close the furrow.

LOCK-UP

When the spring is un-notched, the unit can be locked up in a raised position.

INDIVIDUAL DISENGAGING

Slide the cam and turn 1/4 turn.

DRIVE CHAIN

IMPORTANT: Before starting up, check the proper assembly of chains

The drive chain has a hardened surface that increases wear resistance and extends the life of the chain. The drive chains are spring loaded and therefore, self adjusting. The only adjustment needed is to shorten the chain if wear stretches the chain and reduces spring tension. The pivot point of the chain idlers should be checked periodically to ensure they rotate freely. The drive chain is 5R, and has 124 links with the connector link. Use a chain lubricant spray daily, or as needed.

SEED HOPPER

A 3 L plastic hopper is standard on all versions. A 1.5 liter metal hopper is optional.

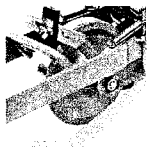
MS Mini Seed Planter

OPTIONS – ROW UNIT ATTACHMENTS

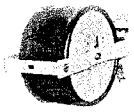
11540.amc Concave cast iron wheel with rubber tire, 4" x 12"

6530 Cage wheel, 4½" x 10" **Ver. A, Ver. C**

650366 Cage wheel, 6½" x 10" **Ver. D**



7147 Intermediate press wheel only, stainless steel **Ver. A, Ver. C**



6512 Press wheel, rear, rubber, 5½" x 10" **Ver. A, Ver. C**

6612 Press wheel, rear, rubber, 6½" x 10" **Ver. D**

6750.1CO Complete wheel, rear, stainless steel, 4" x 8" **Ver. A, Ver. C**

6600 Stainless steel press wheel, 4" x 10" **Ver. A, Ver. C**

642458 Stainless steel press wheel, 5½" x 10" **Ver. C**

6581.a Stainless steel press wheel, 6½" x 10" **Ver. D**

652940 2" – 4" adjustable shoe, **Ver. A, B, C, D**

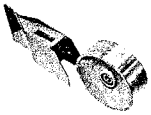
6500 Standard shoe

6500.6 Narrow shoe

6500.6 Special shoe with a short point, **Ver. A, B, C, D**

6465.a 1.5 L metal hopper

643508 3 L plastic hopper with lid



Wide shoe & wide hiller for planting in bands of 2 ^{2}/3" **Ver. A**

MS Mini Seed Planter

SEED METERING SYSTEM

Metering box for Versions A and B
Single row planting

This metering box for version A and version B is specially designed to meter on a single row. Use this metering box for most small seeds whose seed size is not larger than 5mm while using the appropriate seed disc.

Metering box for Version C
Twin line planting

This metering box is the same as on the version A except it is equipped with an extra scraper which is positioned over the standard scraper. This extra scraper is specially designed for metering seeds in double rows. This metering box can be easily exchanged with that of version A & B. It is also equipped with a disc that has a double row of holes in it.

Use this metering box for seeds of sizes less than 3mm such as carrots and onions.

Version C also requires a special 2 seed line shoe for an inter-row spacing of 2" (5cm) or 2 3/4" (7cm)..

NOTE: For version C it is necessary to inactivate or "pull out" the 2 pins and secure with the hairpin (as described in section ADJUSTMENTS)

Metering box for Version D

Each version D unit contains two staggered metering boxes.

When planting in a single line, it is the same metering box as for version A and B. When planting a double line it is same box as for version C.

Metering box for Version E metering units.

Each version E unit is hung within a fixed frame with front rubber and rear stainless steel rollers for seed bed planting.

When planting in a single line, the same metering box as for version A and B is used. When planting a double line the same box as for version C is used.

All versions of metering boxes:

For each version, discs with 18 - 30 - 36 - 60 - 72 - 120 - and 180 holes are available with diameters from .5mm.

It is also possible to supply discs with groups of 2 - 3 - 4 holes, enabling to plant groups of several seeds at regular intervals (hilldropping).

It is recommended that you mark each scraper and each disc so that they can always be mounted in the same metering box. Even though they are interchangeable, they have been adjusted together as an assembly, and it is preferable to run them together.

With a wide shoe, it is possible to use the discs with 1 or 2 rows of holes (according to the required population).

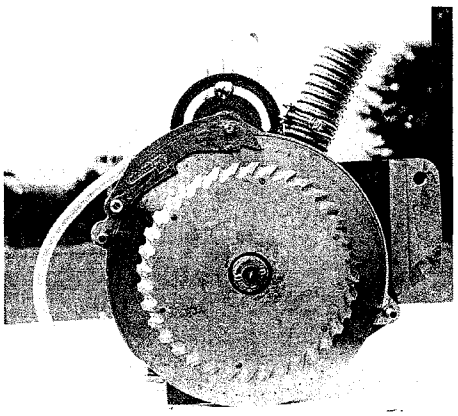
IMPORTANT: Many factors can negatively influence your planting: seed labels in the seed, plugged holes, warped scraper.

To avoid problems with the metering box in the long run it is necessary:

- **To check carefully the position of the discs and scrapers.**
- **To carry out periodical checks of the metering unit.**
- **To clean the inside of the metering boxes at least twice a day.**
- **Blow out the metering boxes with a separate air hose, especially when planting small or difficult seeds.**

MS Mini Seed Planter

METER BOX ADJUSTMENTS



MAIN ADJUSTMENT

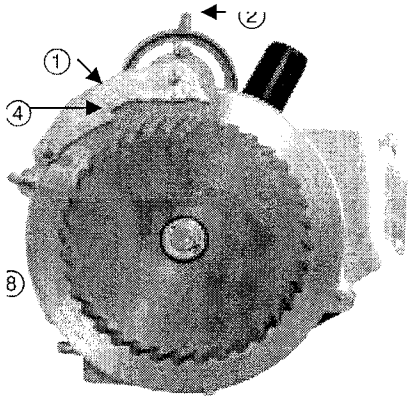
The outside indicator lever

The outside lever on the metering box cover makes two adjustments at the same time.

It is these two factors that influence the degree of singulation of the seed.

1. **The lever adjusts the height of the scraper (1) in relationship to the holes in the disc.**
2. **At the same time the lever (2)adjusts the air suction (from the turbofan) to the weight of the seed.**

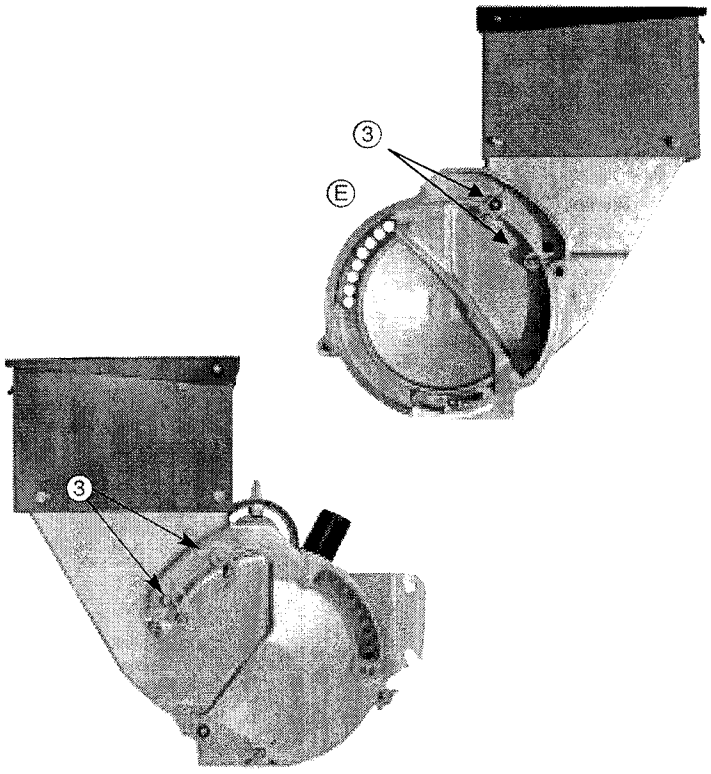
The 0 adjustment is recommended as a starting point because in most cases, it provides the best balance between skipping and doubling.



When the indicator lever is positioned to the **+**, it raises the scraper over the holes of the disc and increases the amount of suction
This will reduce the number of skips.
It may cause doubles if the lever is raised too high.

When the indicator is positioned to the **-** it lowers the scraper over the holes and reduces the degree of suction
This will reduce the number of doubles.
It may cause skipping if the lever is too low.

The clear plastic control window in the cover allows you to monitor the results of the seed on the seed disc.



SECONDARY ADJUSTMENT

Adjustable pins (3)

A secondary selection is available for small raw seeds (broccoli, carrots, cabbage) by using the 2 adjustable pins. When the 2 pins are pushed in and secured with the hairpin (through the outside hole), a secondary scraper is activated which scrapes along the bottom of the seed line. When planting pelleted or larger sized seeds (sugarbeet, spinach, coated lettuce) these 2 pins should be inactivated or in the "pulled out" position and secured with a hairpin through the inside hole.

MS Mini Seed Planter

SEED DISC

Use the proper seed disc for different seeds. Check your type of seed, and use the **Seed Disc Recommendations** chart to determine the correct disc for your crop.

It is important to use seed discs that are clean and in good condition. Customized seed discs are not shown, but are available upon special request. It is not recommended to drill out your own seed discs. Any slight burrs or imperfections in drilling will alter your metering. The precision of your seed discs must be maintained to have proper metering.

The brass agitator screws onto the seed disc with 6 special screws.

If you remove your seed discs from the metering box, to clean or use different seed discs, it would be beneficial, when re-using the seed discs, to place them back into the same metering box. You can use a marker to identify the seed disc to the metering box.

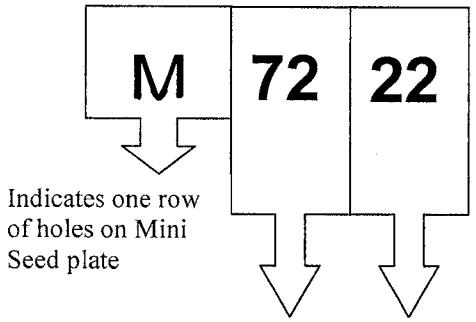
SEED DISC IDENTIFICATION

The size of the seed disc is engraved into the back of the seed disc. The first 2 numbers of a 4 number series indicates the number of holes in the seed disc. The second two numbers indicates the size (diameter) of the holes.

Example, Seed disc M 7222
has 72 holes,
each hole having a diameter of 2.2 mm.

HOLE SIZE EXAMPLES

M 10 = 1.0 mm
M 12 = 1.2 mm
M 20 = 2.0 mm
M 35 = 3.5 mm



SEED DISC RECCOMENDATIONS

Prefix M Indicates one row of holes

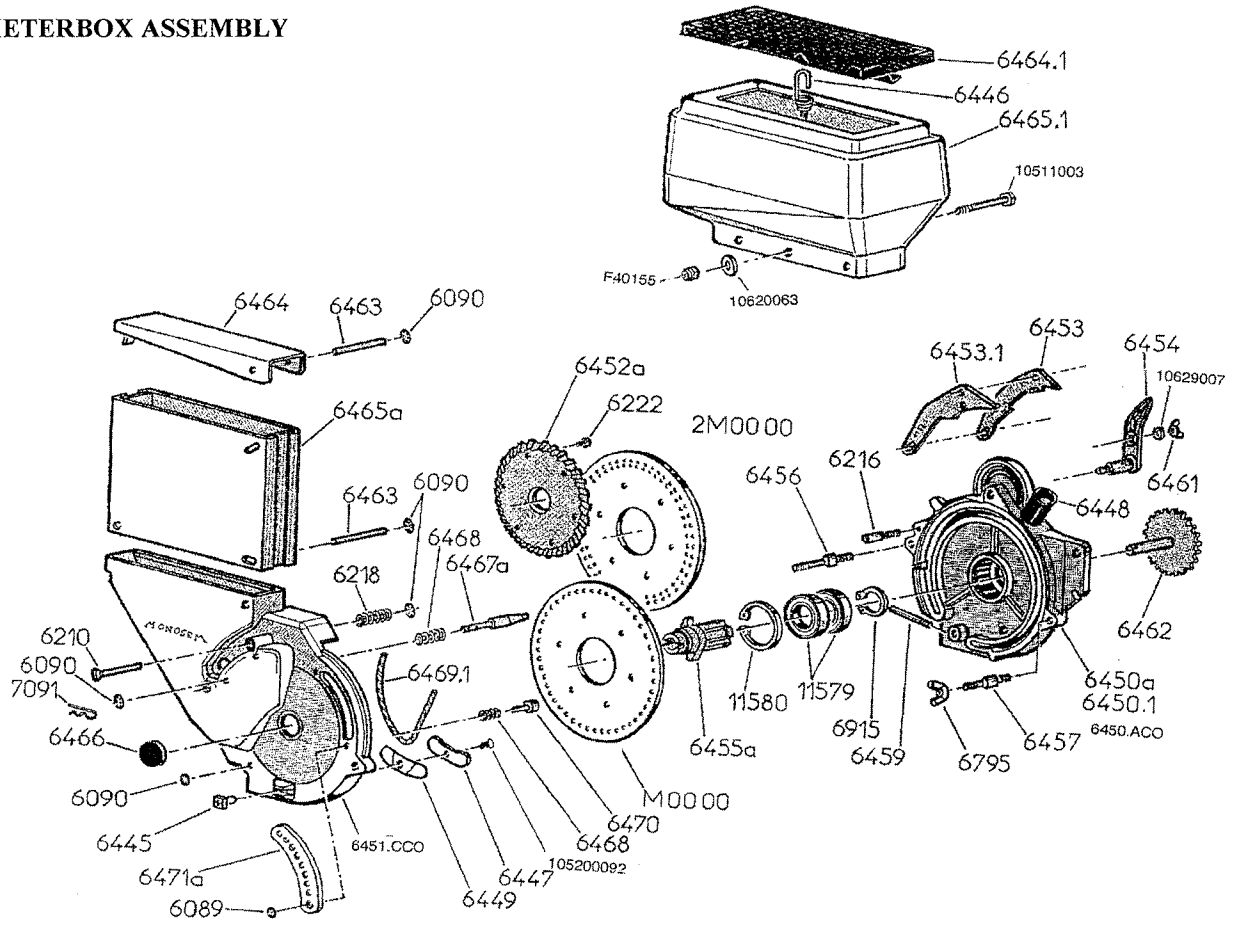
Prefix 2M Indicates two rows of holes

Prefix MC Indicates seed plate complete with agitator.

Asparagus	2mm	M6020
		M112020
Beet, red	2mm	M6020
Broccoli	1.2mm	M3612
/ Cauliflower		M7212
Cabbage	1.2mm (1mm)	M3612
		M7212
Carrot -raw	.7mm	M6007
		M12007
-pelleted	1.2mm	M6012
		M7212
Chives	.7mm	M6007
		M12007
Cucumber	1.8 or 2mm	M1818
		M1820
Endive	.6mm	MM6006
Fennel	1.2mm	M3612
		M7212
Leek	1mm (.9-1.2mm)	M3610
		M7210
Lettuce -pelleted	2.2mm	M6022
		M7222
-raw	6mm	M6006
-film coated	.7mm	M6006
		M6007
Melon	1.8mm	M1818
		M1820
Onion -raw	1.2mm	M3612
		M7212
Parsley	.7mm	M6007
		M18007
Pepper	1.2mm	M3612
		M7212
Poppy	.8mm	M7208
Radish	1.2mm (1.8mm)	M7212
Spinach	1.8mm	M6018
		M7218
Tomato	1mm	M7210
Turnip	.9mm	M7209

MS Mini Seed Planter

METERBOX ASSEMBLY



PART No.	DESCRIPTION
6089	Rubber ring
6090	Snapring 6 mm
6210	Pressure pin for scraper
6216	Fixed pin
6218	Pressure spring
6222	Hardware for agitator
6445	Plug
6446	Bungi cord for lid
6450.a	MS metering box shell only
6450.ACO	Housing complete w/ bearings, pins, etc..
6450.1	Housing complete w/ bearings, pins, etc.. for Version D application (front box)
6451.CCO	Cover complete
6452.a	Agitator, MS metering box
6453	Selector, MS
6453.1	Selector, second row holes
6454	Adjustment lever for MS selector
6455.a	Socket shaft, MS metering box
6456	Rear tightening rod cover
6457	Front tightening rod cover
6459	Air pressure cap
6461	Wing nut, 6mm
6462	Sprocket, MS metering box

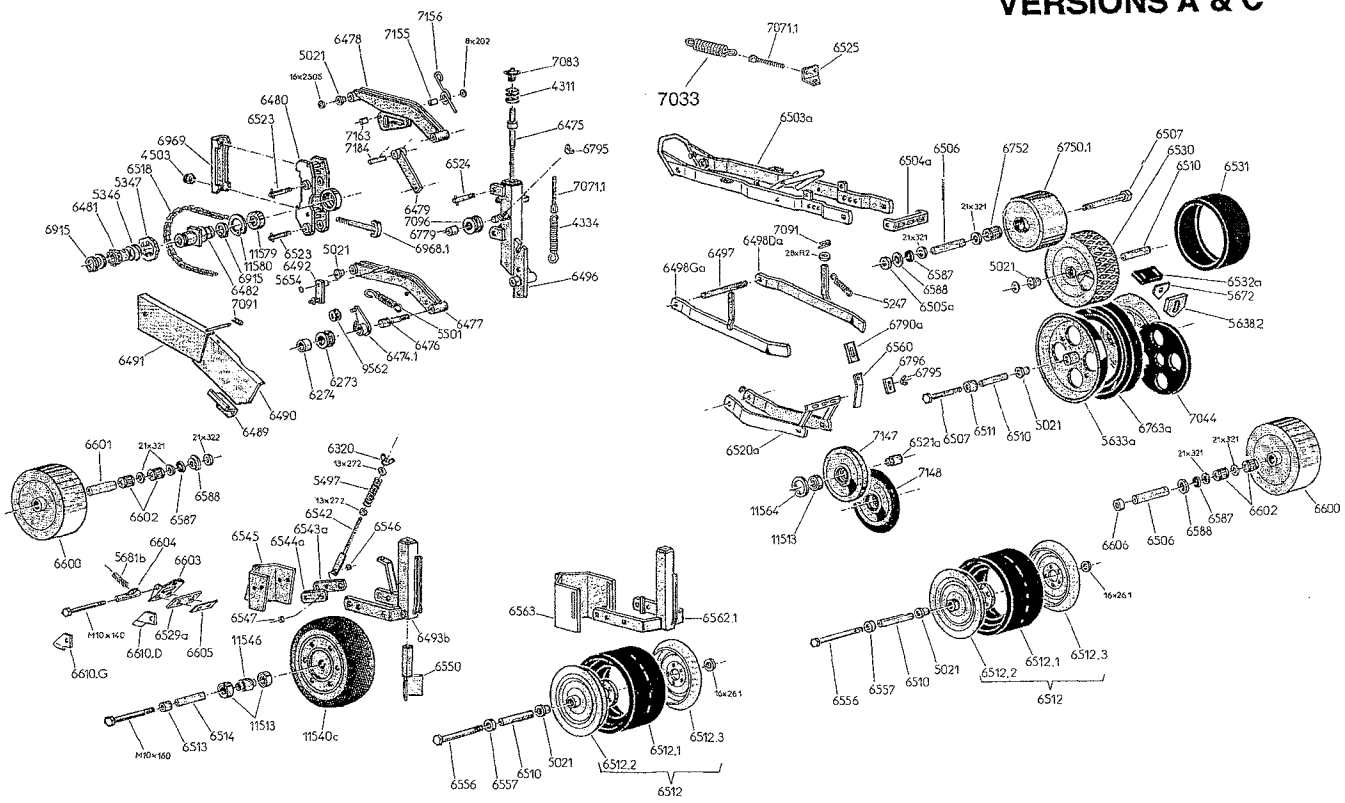
PART No.	DESCRIPTION
6463	MS hopper shaft
6464	MS lid for 1.5L hopper
6464.1	MS lid for 3L hopper, w cord
6465.a	MS 1.5L metal hopper,
6465.1	MS 3L plastic hopper
6466	Cover plug
6467.a	Selector shaft, MS lid
6468	Shaft spring
6469.1	MS cover seal
6470.c	
6471.a	Shutter, MS cover
6795	Wing nut, 8mm
6915	Snapring, 30 mm
7091	Hair pin
11579	Bearing (6006 Z)
11580	Snapring I 55
10511003	6x60 bolt
105200092	6x 16 bolt
10620063	.5x16x1.5 washer
10629007	7 x 16 x 1 lock washer
F40155	Nylon lock nut, 6mm

MS Mini Seed Planter

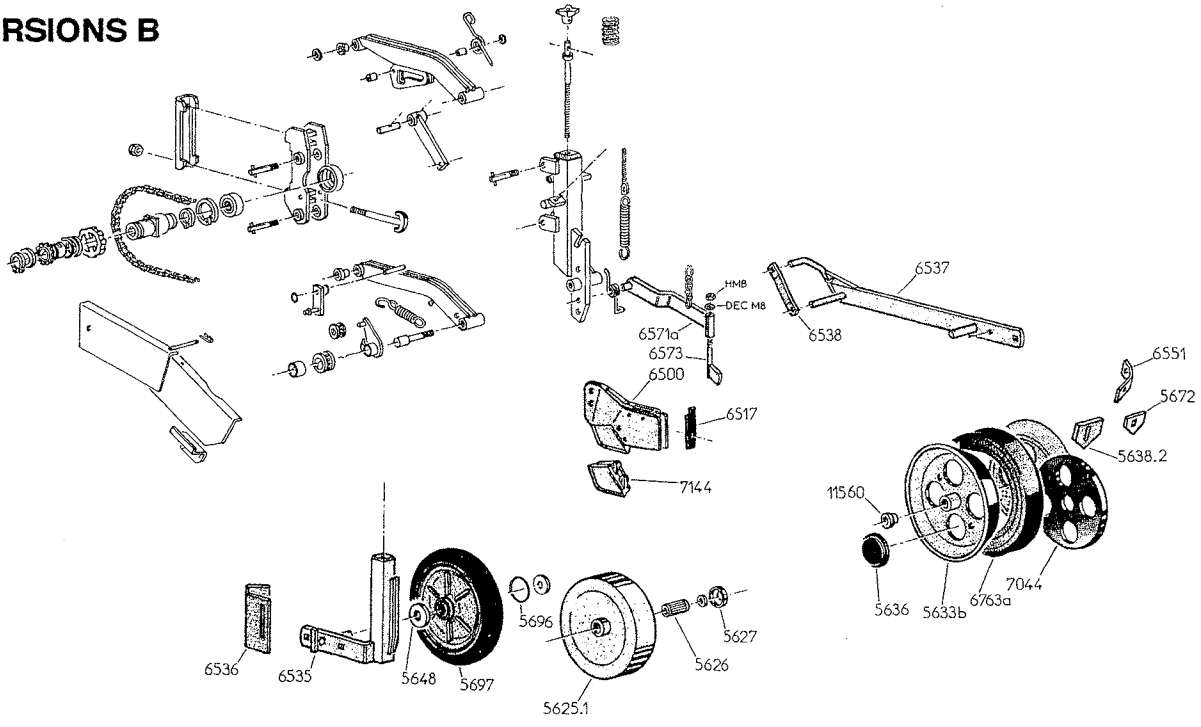
UNIT ASSEMBLY - Ver. A, B, & C

PART No.	DESCRIPTION
11579	Bearing (6006 ZZ)
11580	Snapring i55
10620070	8x20x2, washer
10621046	13 x 27 x 2 washer
10622023	16x25x05, washer
10623009	21x32x1, washer
10623011	21x32x2, washer
10629050	18x7x27x2 washer w/slot
11540 c	Press wheel 300 X 100
11540.1	Tire only
11540.2b	Half plastic rim 300x100 (16 shaft)
11546	Bushing inside wheel 300 X 100
11560	Self-lubricating ring, concave wheel version B
11564	Snapring i47

VERSIONS A & C



VERSIONS B



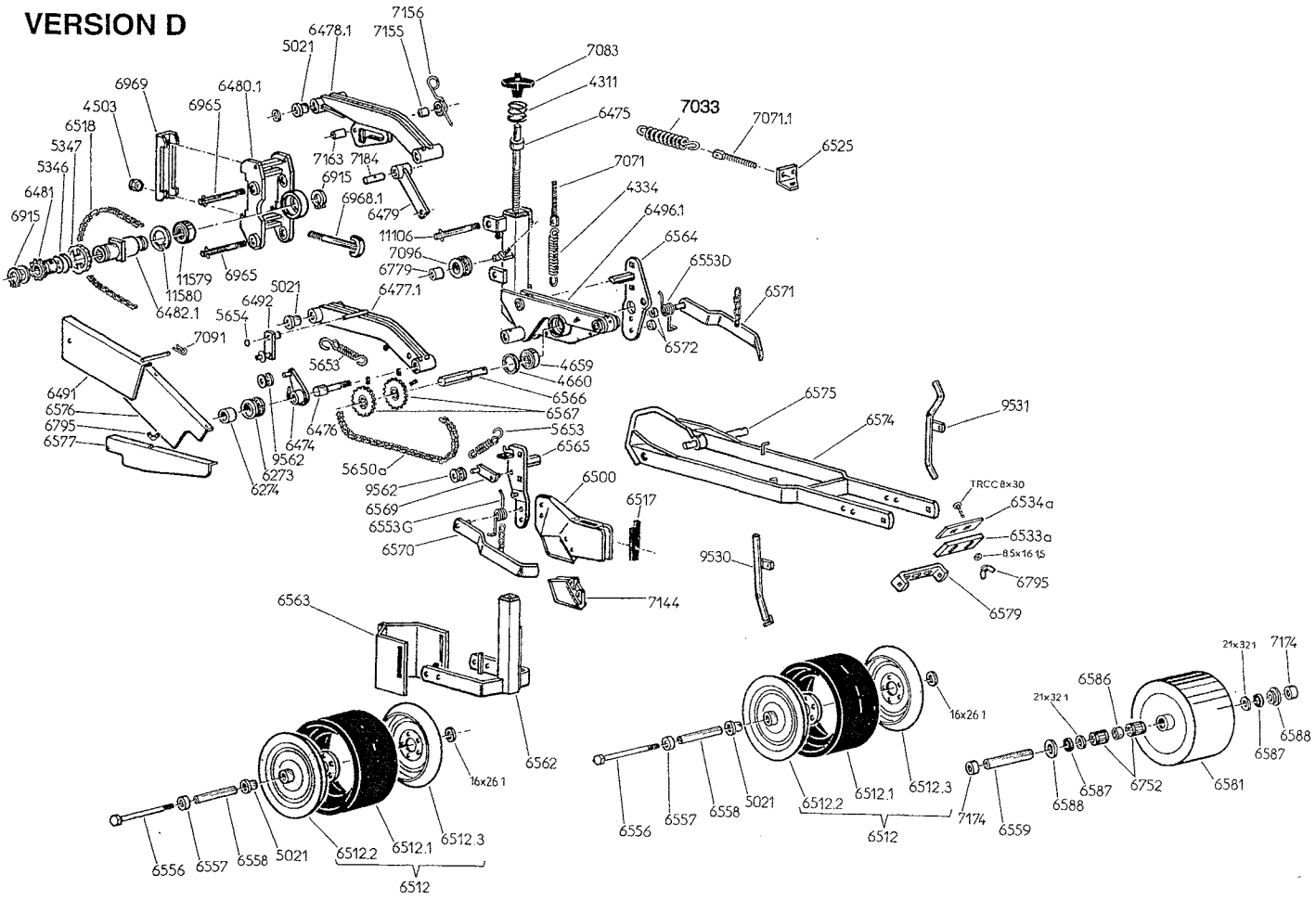
MS Mini Seed Planter

UNIT ASSEMBLY - Ver. A, B, & C

PART No.	DESCRIPTION
4311	Handwheel spring
4334	Spring (R96)
4503	Locking nut 16 mm
5021	Self- lubricating bushing (B25)
5247	Spring (R65)
5346	Spring (R104)
5347	Handwheel, clutch
5497	Spring (R115)
5625.1	Stainless steel front wheel, 280 X 70 (M25T)
5626	Bearing, 70 mm (R70)
5627	Dust cap
5633.a	Half rear press wheel (Z69B)
5633.b	Half rear press wheel, special B version
5636	Wheel plug
5638.2	Greenflex scraper for concave wheel
5648	Protector cap
5653	Tension spring (RS17)
5654	Stop snap ring 12mm
5672	Facing plate for scraper
5681.b	Scraper spring
5696	Seal, Farmflex wheel 280 x 65
5697	Farmflex wheel complete, 280 X 65 standard
5697.1	Tire only
5697.2	Rim only
6273	Idler roller
6274	Self-lubricating bushing
6320	Wing nut, 12 mm
6474	Chain idler
6475	Depth adjustment screw
6476	Rear shaft, lower arm
6477	Lower arm
6478	Upper arm
6479	Locking hook
6480	MS unit head
6481	Drive sprocket, 14 tooth
6482	Declutching tube, MS unit head
6489	Chain guard holder
6490	Lower chain guard
6491	Upper chain guard
6492	Articulated housing bracket
6493.b	Front wheel bracket, version A
6496	Central bloc, MS frame
6497	Rear shaft, MS frame
6498.Da	Intermediate MS scraper, right side
6498.Ga	Intermediate MS scraper, left side
6500	Narrow shoe, MS
6500.p	Narrow shoe, MS flat bottom
6503.a	Rear wheel carrier fame
6504.a	Rear frame tie
6505.a	Spacer bushing
6506	Wheel shaft. 12x20x140
6507	Wheel bolt (10 X 165)
6510	Tube shaft for concave wheel, 11x16x140
6511	Concave wheel spacer
6512	Press wheel, rubber, 250 x 145
6512.1	Tire only
6512.2	Rim half, LH w/ threaded hub
6512.3	Rim half RH
6513	Spacer, front wheel
6514	Shaft tube,front wheel, 11x16x113
6515	Front wheel bolt (10 X 140)
6518	Chain, MS unit (120 links)
6520.a	Intermediate press wheel frame
6521.a	Roller bearing socket, intermediate press wheel
6523	Parallelogram shaft, unit head
6524	Upper shaft, unit head
6525	Bracket, up pressure spring
6529.a	Greenflex scraper, rear steel wheel, 100
6530	Cage wheel
6531 x	Tire, cage wheel
6532.a	Scraper, cage wheel
6535	Front wheel bracket, version B
6536	Clod remover, version B
6537	Carrier arm, rear wheel, version B
6538	Reinforcement bar, rear wheel carrier arm
6542	Adjustment rod, front clod remover version A
6543.a	Clod remover bracket, right
6547	Bushing spacer, clod remover arms
6550	Clod remover for version C
6556	Axle bolt, 10 x 200
6557	Spacer bushing, 16 x 25 x 15 mm
6587	Rubber washer
6588	Sholder washer
6550	Intermediate clod remover, double shoe
6551	Rear scraper bracket, version B
6587	Rubber washer
6600	Stainless steel wheel, 250x105
6601	Spindle wheel, 250x105
6602	Roller, number R25
6603	Scraper holder, for wheel 250x105
6604	Support tube for scraper, wheel 250x105
6605	Scraper plate
6606	Spacer bushing
6607	Pin, 10x185
6608	Support spacer,scraper wheel 250x105
6612.D	Sidewall scraper, RH
6610.G	Sidewall scraper, LH
6750.1	Stainless steel wheel, 210x100
6752	Roller bearing 50 mm
6761	Roller bearing spacer
6763.a	Rubber tire, concave wheel
6790 a	Greenflex scraper, intermediate press wheel
6795	Wing nut, 8 mm
6796	Greenflex scraper plate
6915	Snapring, 30 mm
6968.1	T bolt with nut
6969	Clamp facing
7033	Spring, up pressure
7044	Cover plate for concave press wheel (for rocks)
7071.1	Tension rod
7083	Hand wheel depth control
7091	Hair pin
7147	Single stainless steel intermediate press wheel only
7148	Intermediate wheel with self cleaning tire
7148.1	Self cleaning tire only
7155	Bushing lift stop
7156	Spring
7163	Bushing for parallel linkage
7184	Pin lift stop
9562	Chain roller (G12AS)
11513	Bearing (6204-2RS)

MS Mini Seed Planter

UNIT ASSEMBLY - Ver. D



MS Mini Seed Planter

UNIT ASSEMBLY - Ver. D

PART No.	DESCRIPTION
4311	Handwheel spring
4334	Spring (R96)
4503	Locking nut, 16mm
4659	Bearing (205 KRR)
4660	Snapring (521)
5021	Self-lubricating bushing (B25)
5346	Spring (R104)
5347	Handwheel, clutch
5626	Roller bearing, 70mm
5653	Tension spring (RS17)
5654	Stop snap ring 12mm
6273	Idler roller
6274	Self-lubricating bushing
6474	Chain Idler
6475	Depth adjustment screw
6476	Rear shaft, lower arm
6477.1	Lower arm, version D
6478.1	Upper arm, version D
6479	Locking hook
6480.1	MS unit head, version D
6481	Drive sprocket, 14 tooth
6482.1	Declutching tube, MS unit head, version D
6491	Upper chain guard
6492	Articulated housing bracket
6496.1	Central block, MS frame version D
6500	Narrow shoe, MS
6512.3	One-half rim
6517	Windshield, narrow shoe
6518	Chain MS unit (120 links)
6533.b	Scraper, for 170 mm wheel
6534.b	Scraper plate
6553.d	Tension spring, intermediate hiller, right side
6553.g	Tension spring, intermediate hiller, left side
6558.a	Shaft tube, front and rear wheel
6559.a	Shaft tube
6562.a	Front wheel bracket, version D
6563.a	Clod remover,; version D
6564	Shoe mounting bracket, right side
6565	Shoe mounting bracket, left side
6566	Drive shaft, rear meter box
6567	Drive sprocket, rear meter box, 21 tooth
6568	Chain, rear unit, 5R (68 links)
6569	Arm, chain idler
6570.a	Intermediate hiller, left side
6571.a	Intermediate hiller, right side
6574.a	Rear wheel carrier frame, version D
6575	Rear shaft, version D
6576	Lower chain guard
6577	Rear chain guard
6579.a	Scraper mounting bracket
6581.a	Rear steel wheel, 250x170
6586.a	Bushing

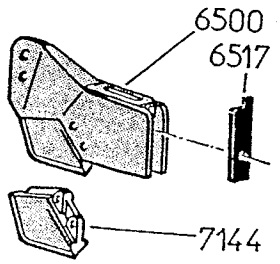
PART No.	DESCRIPTION
6587	Rubber washer
6588	Washer, shouldered
6597	Front wheel bolt (10x230)
6598	Spacer
6612	Rubber press wheel complete (250x170)
6612.1	Tire only, self cleaning, 250 x 170
6612.2	One-half rim with hub
6752	
6779	Bushing, self lubricating
6795	Wing nut, 8mm
6915	Snapring, 30mm
6965	Parallelogram shaft, unit head
6968.1	T bolt with nut
6969	Clamp facing
7033	Up pressure spring
7071.1	Tension rod
7083	Handwheel depth control
7091	Hair pin
7096	Chain roller
7144	Cast point, narrow shoe
7155	Bushing lift stop
7156	Spring
7184	Pin lift stop
9559	Bushing for wheel 250 x 170
9562.1	Chain roller - counter sunk hole
11106	Upper shaft, unit head
11579	Bearing (6006ZZ)
11580	Snapring (i55)
10622024	Washer, 16 1/2 x 26 x 1

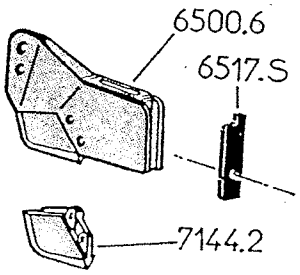
ROW UNIT _____ _____

MS Mini Seed Planter

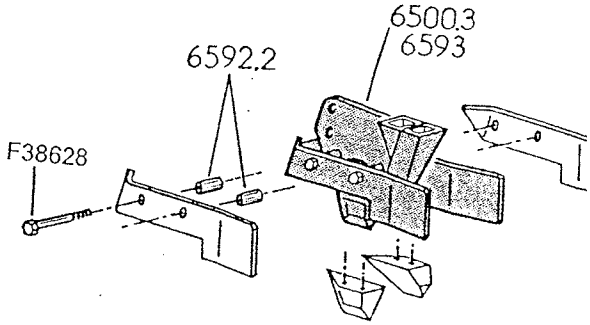
ASSEMBLY - SHOES

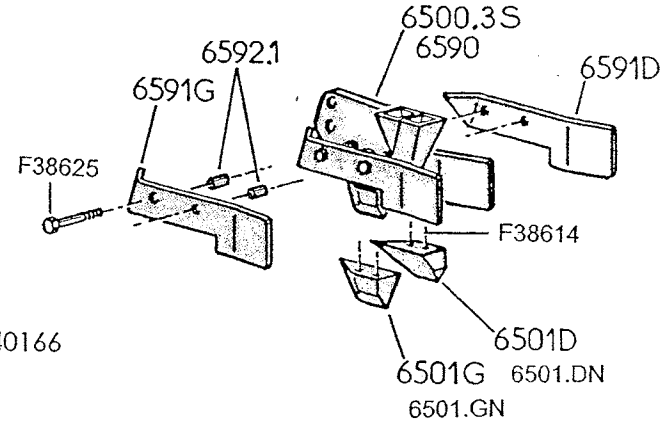
Version A	
6500	Standard
6500.6	Narrow Shoe (US)
6517	Rubber shield (6x10 bolt)
6517.S	Rubber wind flap, for 6500.6 shoe
7144	Cast point, standard shoe
7144.2	Cast point, narrow shoe (US)
10176003	Rivet, 5x34
Version C	
6500.3	Double outlet shoe (70mm between points)
6500.3S	Double outlet shoe (50mm between points)
6501.D	Cast point, RH double shoe
6501.G	Cast point, LH double shoe
6521.2	Intermediate press wheel spacer, outside (70mm)
6521.3	Intermediate press wheel spacer, outside (50mm)
6522.1	Intermediate press wheel spacer, inside (50mm)
6522.2	Intermediate press wheel spacer, inside (70mm)
6590	Double shoe frame (50mm)
6591.D	Right wing, double shoe
6591.G	Left wing, double shoe
6592.1	Spacers (50mm)
6592.2	Spacers (70mm)
6593	Double shoe frame (70mm)
652940	Adjustable shoe w/ cast point, right hand
652941	Adjustable shoe w/ cast point, left hand
900316	Spacer block, 1/4" thick
F38614	Hex head bolt, 8 x 16 mm
F38625	Hex head bolt, 8 x 70mm
F38628	Hex head bolt, 8 x 90mm
F38664	Hex head bolt, 10 x 70mm
F40162	Hex nut, 8mm
F40166	Hex nut, 10mm
6501.GN	UHMW tip, LH double shoe
6501.DN	UHMW tip, RH double shoe



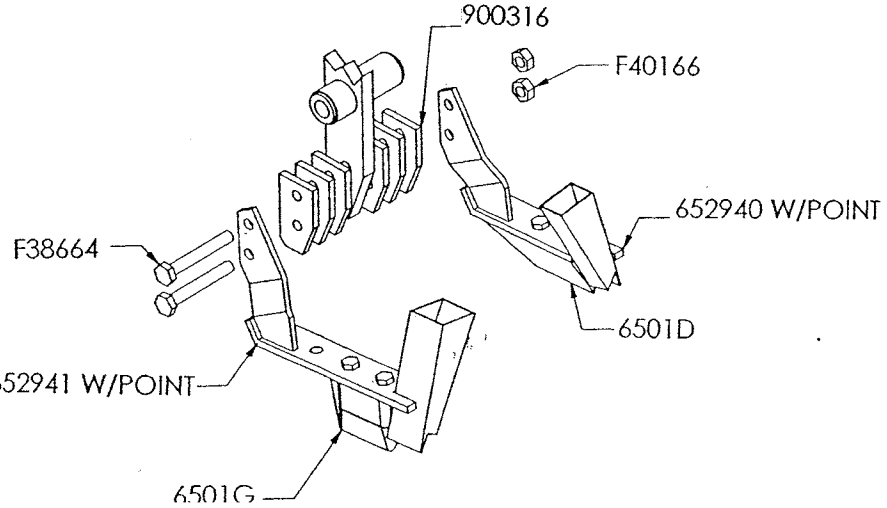


SHOES VERSION C - FIXED





SHOES VERSION C - ADJUSTABLE



SPACERS

RIGHT	LEFT	SPACING
0	0	2.25"
1	0	2.5"
1	1	2.75"
2	1	3"
2	2	3.25"
3	2	3.5"
3	3	3.75"

TABLE OF CONTENTS

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6. ROW UNIT

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MICROSEM GRANULAR INSECTICIDE SYSTEM

The Microsem system meters microgranular products such as insecticide and herbicide with precision. The system is ground driven and has a positive displacement. The output is set by means of a transmission that is unaffected by a change in planting speed. The microsem system is mounted to the toolbar frame with support brackets to reduce weight on the planter unit. The microsem system with auger is equipped with a telescoping outlet, and its output starts from a minimum of 2-3 lbs/ acre.

Each microsem hopper has a 33 lb. capacity and can be used with a double outlet for two row units or with a single outlet for one row unit.

There are two different support brackets available, the standard model and a special model for folding toolbar planters. Avoid placing the drive next to a drive wheel.

The drive sprocket is mounted on the lower hex shaft. The hoses direct the granular product directly between the disc openers via the drop tubes, or behind the disc openers via a spreader tube.

Attention: the furnished hoses may be too long so they should be cut as short as possible to avoid bends. This should be done while the PLANTER IS HOOKED UP AND IN A RAISED POSITION.

ASSEMBLY

On a planter for wide row spacings (versions A & C) Fig 24. The drive is to be positioned between 2 units, as far as possible from the drive wheels. The drive sprocket ① is mounted on the LOWER hex shaft.

On planter for narrow row spacings (version B) Fig 25. The drive is to be positioned on the outside of the planter units on the right or on the left of a drive wheel block according to the available space. The drive sprocket ① is mounted on the intermediate shaft ③ of the drive wheel block.

The hoses direct the granular product directly to the back of the shoe. These sliding assemblies ④ and special drop tubes ⑤.

IMPORTANT: Avoid moisture contamination. Moisture in the product will cause hardening and could cause chain breakages. To avoid this problem, empty hoppers and store in a dry place.

NOTE: This unit should be used only with microgranular products and not with powders or granulates. It is possible to meter large granular products provided the inside auger is changed fora special one.

The 2-row metering box can be changed into a 1-row box by replacing the double outlet with a single outlet and installing a shield in the inside.

WARNING Agricultural chemicals can be dangerous. Improper use can result in injury to persons, animals and soil. Handle with care and follow instructions of chemical manufacturer.

MICROSEM GRANULAR INSECTICIDE SYSTEM

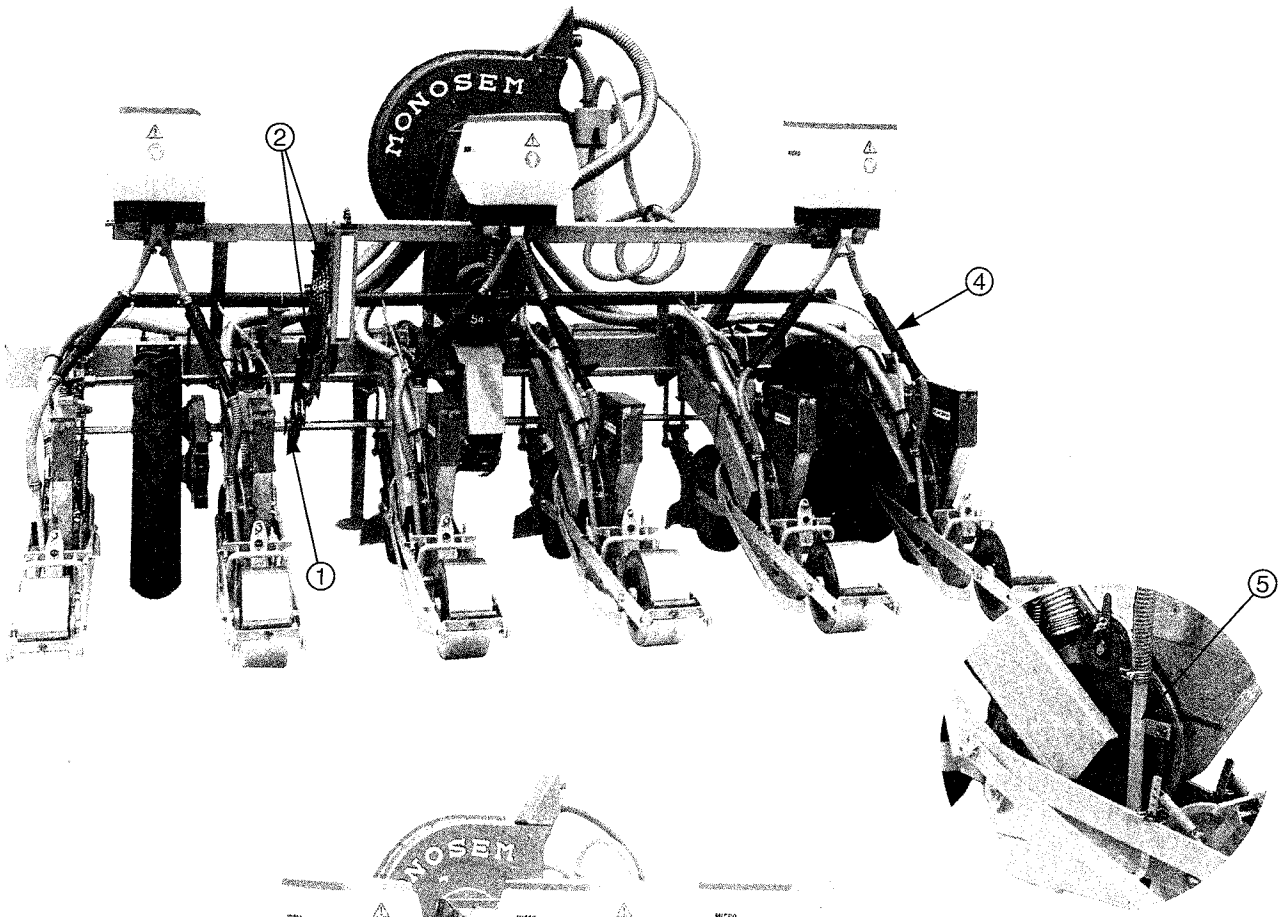


Fig. 24

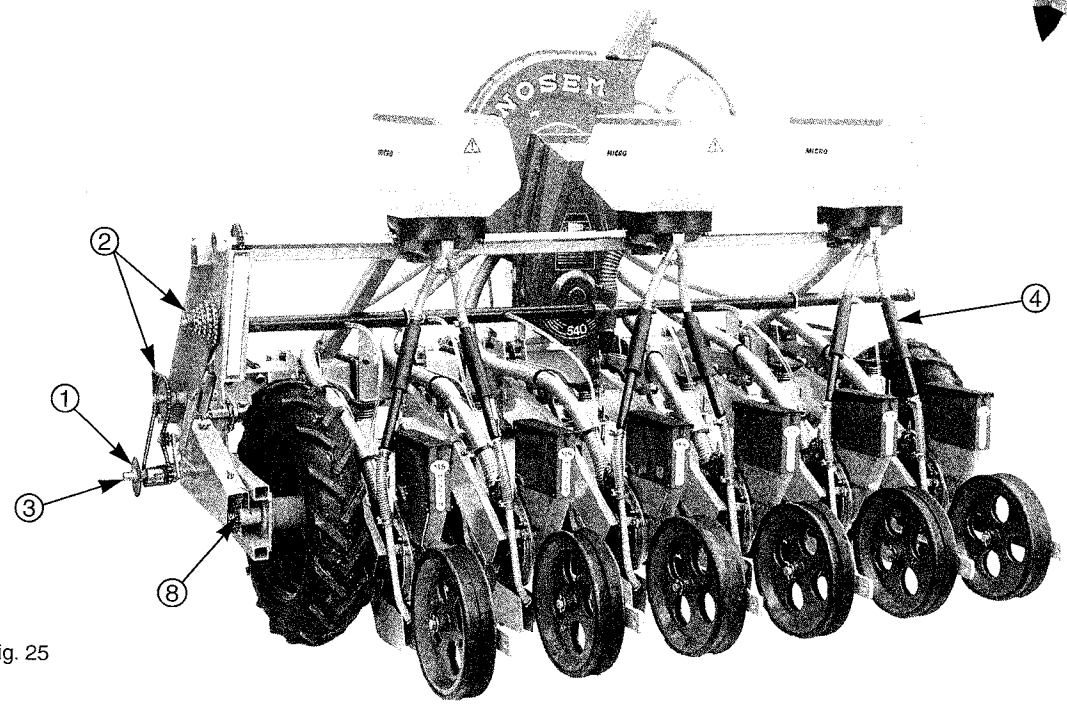
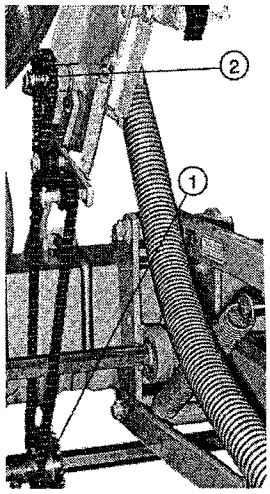


Fig. 25

SETTING OF THE OUTPUT

The output is a function of the number of rotations of the spindle of the metering boxes, which is set primarily with the double sprocket (1) and the interchangeable sprockets (2). The chart provided will assist with the setting and also indicates the sprockets to be used for the principle commercial products. The furnished information is a recommendation only.



HOW TO TEST FOR INSECTICIDE RATES

Measure out a distance of 328 feet (100m).

Set the sprocket combination to A=12, B=30, C=12. (This ratio = 0.24 or the number of Microsem shaft rotations for 1 drive wheel rotation.)

Remove the hoses from a 2 outlet hopper, placing a bag or other container to catch the product. Put the product into the Microsem hopper. Engage the Microsem and drive forward the pre-measured distance. Weigh the amount of product caught in the container and convert to grams.

Ounces x 31.103481 = grams
Inches x 2.54 = centimeters

Use the following formula:

$$\text{Output} = \frac{10 \times \text{quantity weighted in grams}}{\text{Inter-rows in cm} \times 2}$$

Example:
Inter-rows = 60 cm (23.63")
Quantity weighted = 60 grams (1.929 ounces)

If you require 8 kg/ha or 8 lb/acre, choose the ratio $\frac{8}{5} \times 0.24 = 0.384$

A=12, B=18, C=12

If you require 11 kg/ha or 11 lb/acre, choose the ratio $\frac{11}{5} \times .24 = 0.528$

A=12, B=22, C=20

Output= $\frac{10 \times 60}{60 \times 2}$ = 5 kg/ha or **5lb/acre**

From the following chart, find the closest sprocket combination to achieve appropriate lbs/acre.

NOTE: Because of the large variety of insecticides and its density and irregularity of granular products, it is impossible to provide an exact chart. This is a close approximation only.

MICROSEM MICROGRANULAR INSECTICIDE SYSTEM

Possible Sprocket Combinations			Ratios Obtained
A	B	C	
12	35	12	0.21
12	32	12	0.22
12	**30**	12	0.24
12	**25**	12	0.29
12	**22**	12	0.33
12	20	12	0.36
12	**18**	12	0.40
12	16	12	0.45
12	**15**	12	0.48 or
12	25	20	0.48
12	23	20	0.51
12	**22**	20	0.54
12	21	20	0.57
12	**12**	12	0.60
25	24	12	0.63
12	**18**	20	0.66
25	**22**	12	0.68
12	10	12	0.72
25	20	12	0.75
12	**15**	20	0.80
25	**18**	12	0.83
25	16	12	0.94
25	**15**	12	1 or
12	12	20	1
25	**22**	20	1.13
12	10	20	1.20
25	**12**	12	1.25
25	**18**	20	1.40
25	10	12	1.50
25	**15**	20	1.66
25	**12**	20	2.08
25	10	20	2.50

Less Product

More Product

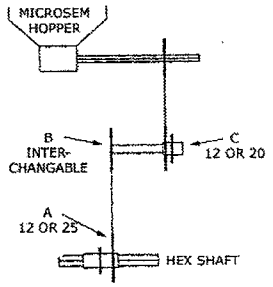
NOTE: The bold sprocket numbers for the interchangeable B sprocket are standard. (12, 15, 18, 22, 25, 30)

The remaining sprockets for the interchangeable B sprockets are available on request.

MICROSEM SETTING CHART- Drive Sprockets to be used

These Settings are theoretical and approximate. Actual output may vary. Other outputs can be obtained by using different sprocket arrangements of the Microsem drive, however travel speed variations will not affect the output.

A = Double sprocket on hex shaft - driven 1
B = Interchangeable sprocket - driven 2
C = 12 or 20 tooth sprocket



#'s PER ACRE		5.35 A/B/C	6.42 A/B/C	7.22 A/B/C	8.03 A/B/C	9.82 A/B/C	11.15 A/B/C
THIMET	22"	12/18/12	12/15/12	12/22/20	12/12/12	12/15/20	25/18/12
20G	30"	12/22/20	12/18/20	25/20/12	25/18/12	25/15/12	25/22/20
	36"	12/18/20	12/15/20	25/16/12	25/15/12	25/12/12	
	40"	25/22/12	25/18/12	25/15/12	25/22/20		

#'s PER ACRE		5 A/B/C	6.5 A/B/C	8.1 A/B/C	9.3 A/B/C	10 A/B/C	11.4 A/B/C	13.5 A/B/C
DASANIT	22"		12/12/12	25/22/12	12/15/20	25/18/12	25/15/12	25/22/20
15G	30"	12/18/20	25/20/12	25/18/12	25/15/12	25/22/20	25/18/20	
	36"	25/22/12	25/16/12	25/22/20	25/12/12	25/18/20	25/15/20	
	40"	25/20/12	25/15/12	25/12/12	25/18/20	25/15/20	25/14/20	

#'s PER ACRE		5.85 A/B/C	6.5 A/B/C	7.2 A/B/C	8.7 A/B/C	9.7 A/B/C	10.8 A/B/C	12.3 A/B/C	14.5 A/B/C
FURADAN	22"		12/25/12	12/22/12	12/20/12	12/18/12	12/22/12	12/15/12	12/12/12
15G	30"	12/22/12	12/20/12	12/18/12	12/15/12	12/22/20	12/12/12	25/22/12	12/15/20
	36"	12/18/12	12/16/12	12/15/12	12/12/12	12/18/20	25/22/12	12/15/20	25/15/12
	40"	12/16/12	12/15/12	12/22/20	12/18/20	25/22/12	12/15/12	25/15/12	

#'s PER ACRE		5.4 A/B/C	7.13 A/B/C	8.91 A/B/C	10.7 A/B/C	12.5 A/B/C	14.25 A/B/C	16.04 A/B/C	17.82 A/B/C
COUNTER 15G	22"	12/18/12	12/22/20	25/22/12	25/18/12	25/15/12	25/22/20	25/12/12	25/18/20
LORSBAN 15G	30"	12/22/20	12/15/20	25/15/12	25/22/20	25/18/20	25/16/20	25/15/20	25/14/20
	36"	12/18/20	25/16/12	25/22/20	25/18/20	25/15/20	25/14/20	25/12/20	
	40'	12/15/20	25/15/12	25/12/12	25/15/20	25/14/20	25/12/20		

		19.6	21.4	23.2
COUNTER 15G	22"	25/16/20	25/15/20	25/14/20
LORSBAN 15G	30"	25/12/20		

MICROSEM SETTING CHART- Drive Sprockets to be used

These Settings are theoretical and approximate. Actual output may vary. Other outputs can be obtained by using different sprocket arrangements of the Microsem drive, however travel speed variations will not affect the output.

#'s PER ACRE		3.56 A/B/C	8.9 A/B/C	10.95 A/B/C	13.35 A/B/C	17.8 A/B/C	22.25 A/B/C	26.7 A/B/C
TEMIK 15G	22"		12/18/12	12/15/12	12/22/20	12/15/20	25/15/12	25/22/20
	30"		12/22/20	12/18/20	12/15/20	25/12/12	25/18/20	25/15/20
GYPSUM	36"		12/18/20	12/15/20	25/12/12	25/20/20	25/15/20	25/12/20
	40"	12/25/12	25/22/12	25/18/12	25/15/12	25/18/20	25/12/20	25/12/20

#'s PER ACRE		1.78 A/B/C	4.45 A/B/C	8.9 A/B/C
TEMIK 15 G	22"		12/15/12	25/12/12
CORNCOB	30"	12/25/12	25/22/12	25/18/20
GRIT	36"	12/22/12	12/15/20	25/15/20
	40"	12/18/12	25/15/12	25/12/20

#'s PER ACRE		2.7 A/B/C	3.2 A/B/C	3.7 A/B/C	4.5 A/B/C	5.6 A/B/C	6.7 A/B/C	7.8 A/B/C	9.4 A/B/C
ZENECA FORCE	22"	12/25/12	12/22/12	12/18/12	12/15/12	12/12/12	25/22/12	25/18/12	25/15/12
3G	30"	12/18/12	12/15/12	12/22/20	25/22/12	12/15/20	25/15/12	25/22/20	25/18/20
	36"	12/15/12	12/22/20	12/18/20	12/15/20	25/15/12	25/22/20	25/18/20	25/15/20
	38"	12/23/20	12/12/12	25/22/12	25/18/12	25/15/12	25/12/12	25/10/12	

#'S PER ACRE		3.4 A/B/C	4 A/B/C	4.6 A/B/C	4.9 A/B/C	5.5 A/B/C	6.7 A/B/C	8.1 A/B/C	10.1 A/B/C
RIDOMIL	22"	12/22/12	12/18/12	12/16/12	12/15/12	12/22/20	12/18/20	12/15/20	25/15/12
GOLD GR	30"	12/16/12	12/15/12	12/22/20	12/18/20	25/20/12	25/18/12	25/22/12	25/18/20
PC11G	36"	12/22/20	25/24/12	12/18/20	12/15/20	25/18/12	25/22/20	25/12/12	25/15/20
	38"	12/21/20	25/22/12	25/22/12	25/18/12	25/15/12	25/22/20	25/18/20	

#'s PER ACRE		3.1 A/B/C	3.5 A/B/C	4.2 A/B/C	5.1 A/B/C	5.7 A/B/C	7 A/B/C	8.5 A/B/C	10.6 A/B/C
GOLD PC	22"	12/25/12	12/22/12	12/18/12	12/15/12	12/22/20	12/18/20	12/15/20	25/15/12
	30"	12/18/12	12/16/12	12/22/20	12/18/20	25/20/12	25/18/12	25/22/20	25/20/12
	36"	12/15/12	12/22/20	12/18/20	12/15/20	25/18/12	25/22/20	25/12/12	12/12/12
	38"	12/23/20	12/21/20	25/22/12	25/18/12	25/16/12	25/22/20	25/18/20	

#'s PER ACRE		13.5 A/B/C	16 A/B/C	20 A/B/C	22.4 A/B/C
AMEBIN	22"	25/18/12	25/15/12	25/12/12	25/18/20
	30"	25/22/20	25/18/20	25/15/20	
	36"	25/18/20	25/15/20	25/12/20	
	40"	25/12/12	25/13/20		

TROUBLE SHOOTING AND CAUSES

Excessive Skipping:
- Seed scraper too low (incorrect setting)
- Seed scraper or selection pieces are bent or not flat
- Seed scrapers not adjusted properly
- Seed disc bent or worn
- Holes of seed disc plugged (bad seed or second air pressure "clean-out" system not properly adjusted)
- Excessive working speed
- Foreign material mixed with seed (labels, etc)
- Defective vacuum hoses
- Seed scraper is dirty with chemical product
- Seed bridging in the hopper due to the seed treatment or moisture

Excessive Doubling
- Seed scraper too high (Improper setting)
- Seed scraper worn
- Holes of seed disc too large (do not fit the seed)
- Seed scrapers not adjusted properly
- Excessive working speed
- Excessive PTO speed
- Seed leakage (seal worn or missing)
- Metering box worn (leaks)

TROUBLE SHOOTING AND CAUSES

Irregular Seeding (skipping, doubling)
- Excessive working speed
- Blocked or worn shoes
- Opening of the shoe deformed or deteriorated
- Ejector at the bottom of the cover dirty or worn
- Intermediate closing hillers bent
- Seed leakage (seal worn or missing)
- Dampness on the inside of the metering boxes (do not plant in damp weather)

Occasional Blockage of the Drive
- Connection between moving and fixed parts (check the bushing stops on the hex shaft, wheel blocks, the space tightener gearbox, alignment of chains, the inside of the metering boxes ...)

Microsem Output Varies between Chutes or Boxes
- Foreign material mixed with product
- Attention: moisture in product
- Outlet chute unit warped
- Hose clogged because too long or bent

Recommendations for Successful Seed Planting

1) Choose a moderate working speed which matches the soil and weather conditions and the required accuracy.
2) As soon as you start up the planter and then at regular intervals, check metering, planting depth and population of seeds.

FERTILIZER

It is recommended to use the fertilizer when using the A and C version planter unit for inter-row spacings of 16" (40cm) and more. See figure 26.

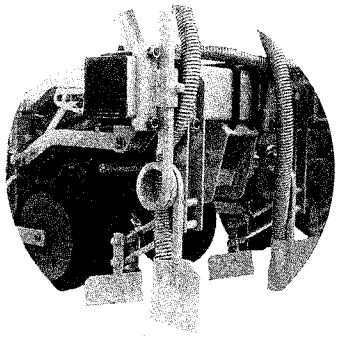
The number of hopper outlets depends on the number of rows to be fed. It is possible to use one fertilizer opener for 2 rows in the case of narrow inter-row spacing.

The fertilizer should be deposited between 2 and 4"(6 and 10cm) on the side of the row.

Setting of the output: The primary adjustment is set by using the lower double sprocket ⑥, then the final adjustment is achieved by using one of the sprockets of the upper sprocket cluster ⑦.

Outputs can thus be obtained varying between 80 to 350 lbs per acre (80 and 350 kg/ha) but due to the different density and size of the fertilizer, it is difficult to give exact outputs.

WARNING Agricultural chemicals can be dangerous. Improper use can result in injury to persons, animals and soil. Handle with care and follow instructions of chemical manufacturer.



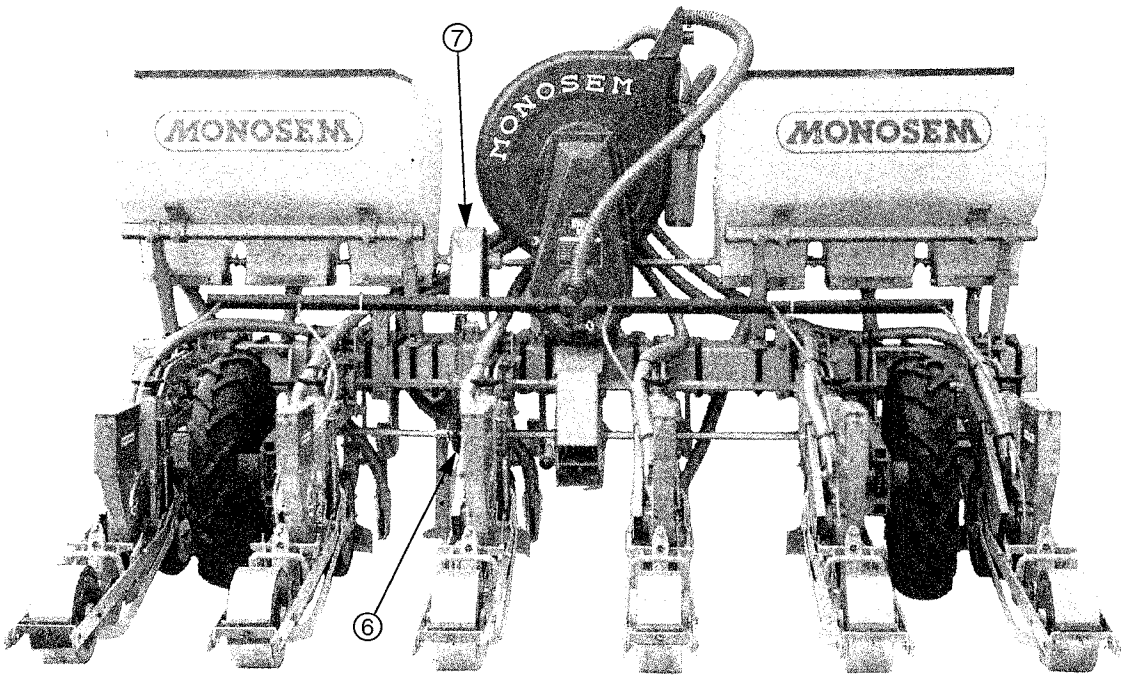
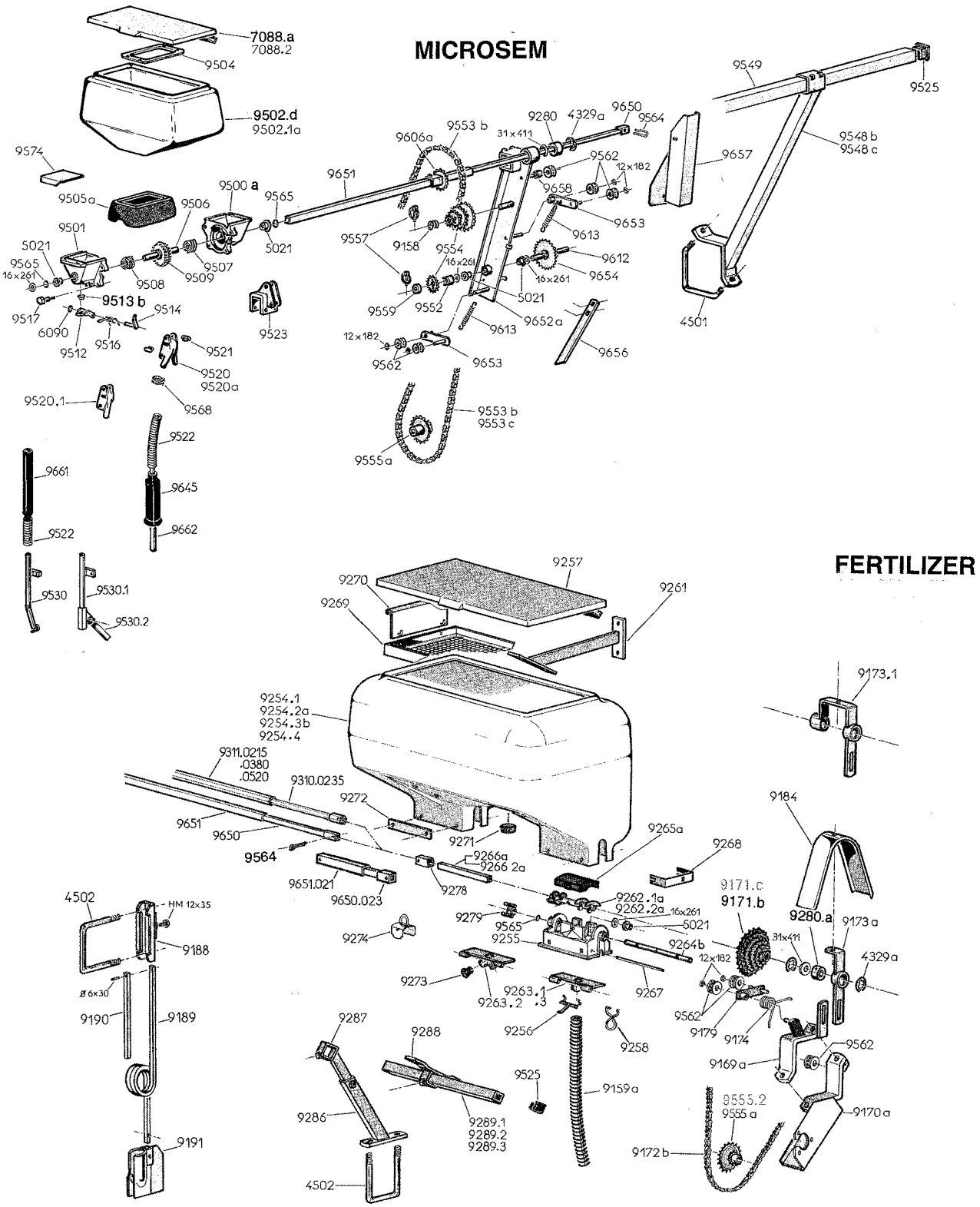


Fig. 26



4329.a	Snapring
4501	V bolt 16 mm
4502	U bolt 16 mm
5021	Self lubricating bushing (B25)
6090	Snapring 6 mm
7088.a	Hopper lid, black (includes clip) - Goes with Hopper 9502.D
7088.2	Clip for hopper lid (25LT) - Goes with Hopper 9502.1A
9158	Spring (R57)
9159.a	Fertilizer hose, 24" length
9169.a	Support bracket fertilizer drive
9170.a	Clamp housing without chain roller
9171.b	Sprocket cluster, with square hole, fertilizer drive
9171.c	Sprocket cluster with Hex bore
9172.b	Chain, fertilizer drive, 5R
9173.a	Bearing holder
9173.1	Double bearing holder
9174	Tension spring
9179	Chain tightener
9184	Protector shield, fertilizer drive
9188	Support clamp, MS fertilizer tine
9189	Fertilizer tine, MS
9190	Reinforcement bar
9191	Fertilizer knife , MS
9254	Plastic fertilizer hopper
9254.1	Fertilizer hopper, 1 outlet
9254.2a	Fertilizer hopper, 2 outlets 1751
9254.4	Fertilizer hopper, 3 outlets 1756
9255	Aluminum housing
9256	Spring, trapdoor
9257	Plastic hopper lid
9257.1	Hopper lid, 1-row, metal
9257.2	Hopper lid, 2-row, metal
9258	Fertilizer hose clamp
9261	Inside hopper reinforcement
9262.1a	Standard fertilizer auger
9262.2a	Hi output fertilizer auger
9263.1	Trap door, 1 outlet
9263.2	Trap door, 2 outlet
9264.b	Spindle, fertilizer metering unit
9265.a	Cover, fertilizer metering unit
9266.a	Drive shaft between housing (L-295, 2-row)
9266.1a	Drive shaft between housing
9266.2a	Connector tube (L-255, 3-row)
9267	Pin for trap door
9268	Reinforcement bracket
9269.1a	Fertilizer sieve for 1 outlet hopper
9269.2a	Fertilizer sieve for 2 outlet hopper
9270	Screen hanger
9271	Drain plug
9272	Reinforcement bar for hopper outlet
9273	Plastic outlet cap, 3 outlet hopper
9274	Cover shield clip, 1 outlet hopper
9278	Drive shaft coupler
9279	Drive fork
9280	Bushing with square hole
9280.a	Bushing with hex hole
9286	Fixed fertilizer mounting bracket
9287	Adjusting fertilizer mounting bracket
9288	Fertilizer hopper support
9289.1	Fertilizer support bar 1'4"
9289.2	Fertilizer support bar 2'10"
9289.3	Fertilizer support bar 4'6"
9311.0215	Female Hex link tube, 215mm
9311.0380	Female Hex link tube, 380mm
9311.0520	Female Hex link tube, 520mm
9310.0235	Female Hex link tube, 235mm
9500.a	Housing, right side
9501	Housing, left side
9502.1a	Hopper, helicide- Goes with Lid 7088.2
9502.d	Microsem hopper - Goes with Lid 7088.a
9504	Steel base, plastic hopper
9505.a	Rubber flap
9506	Main spindle
9507	Left worm gear (V75G)
9507.1	Special helicide auger, lefthand thread
9508	Right worm gear (V75D)
9508.1	Special helicide auger, right hand thread
9509	Central gear (F78)
9509.1	Central gear, special helicide
9512	Trap door
9513 b	Seal, trap door (B70A)
9514	Lever, trap door
9516	Spring, trap door (B139)
9517	Bolt (A117)
9520	Double outlet, front (F76)
9520.a	Double outlet, rear
9520.1	Single outlet (F96)
9521	Plug
9522	Microsem hose, specify length
9523	Clamp
9524	Elbow
9525	End cap, microsem bar
9530	Spreader tube
9530.1	Spreader tube, double row
9530.2	Adjustable tube, double row
9548.c	Microsem support bar
9549	Carrier bar
9552	Bushing
9553.b	Chain, microsem drive (5R)
9554	Interchangeable sprockets
9554.1	10 tooth sprocket
9554.3	12 tooth sprocket
9554.4	13 tooth sprocket
9554.5	14 tooth sprocket
9554.6	15 tooth sprocket
9554.7	16 tooth sprocket
9554.9	18 tooth sprocket
9554.10	19 tooth sprocket
9554.11	20 tooth sprocket
9554.13	22 tooth sprocket
9554.14	23 tooth sprocket
9554.16	25 tooth sprocket
9554.21	30 tooth sprocket
9554.26	35 tooth sprocket
9555.2	Sprocket cluster with hex bore (12,13,21,23, 25)
9555.a	Double sprocket (12-25 tooth)
9557	Lynch pin
9559	Bushing
9562	Chain roller (G12AS)
9564	Microsem clip
9565	Rubber ring (#99)
9568	Microsem hose clamp
9574	Plate for hopper, 1 outlet
9606.a	Upper drive sprocket, 20 tooth
9612	Intermediate spindle, microsem drive
9613	Spring, chain tightener
9645	Rubber sleeve
9650.085	Male drive connector, .85M
9651.085	Female drive connector, .85M
9651.120	Female drive connector, 1.2M
9652.a	Support bracket, insecticide drive
9653	Chain tightener
9654	Double intermediate sprocket (12-20 tooth)
9656	Reinforcement plate
9657	Safety shield, drive chain
9661	Female drop tube
9662	Male sliding tube