

**The
HAMILTON DRUM SEEDER**

Digital Stepper Motor Model

with HD Conveyor

Operator's Manual

Issue 11a

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0.0 REGISTRATION FORM

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0.0 SAFETY NOTES

READ THIS FIRST

As with all our products, great care has been taken in the design of this machine to ensure safety to operators. However, the following points should be noted, and explained to all operators by the person responsible for safety in your organisation:

- 1) During all maintenance, dismantling, and adjustment, disconnect the mains air and electricity supplies (where appropriate) from the machine.
- 2) The machine should never be operated without all guards and covers being securely fixed in position.
- 3) Do not tamper with any air or electrical connections inside or outside control panels. If you feel uneasy carrying out maintenance work, have a qualified engineer or electrician do it for you.
- 4) This machine is designed for the specific purpose of sowing seeds, and should not be put to any other use.

SECTION 1 - CHANGING TRAYS

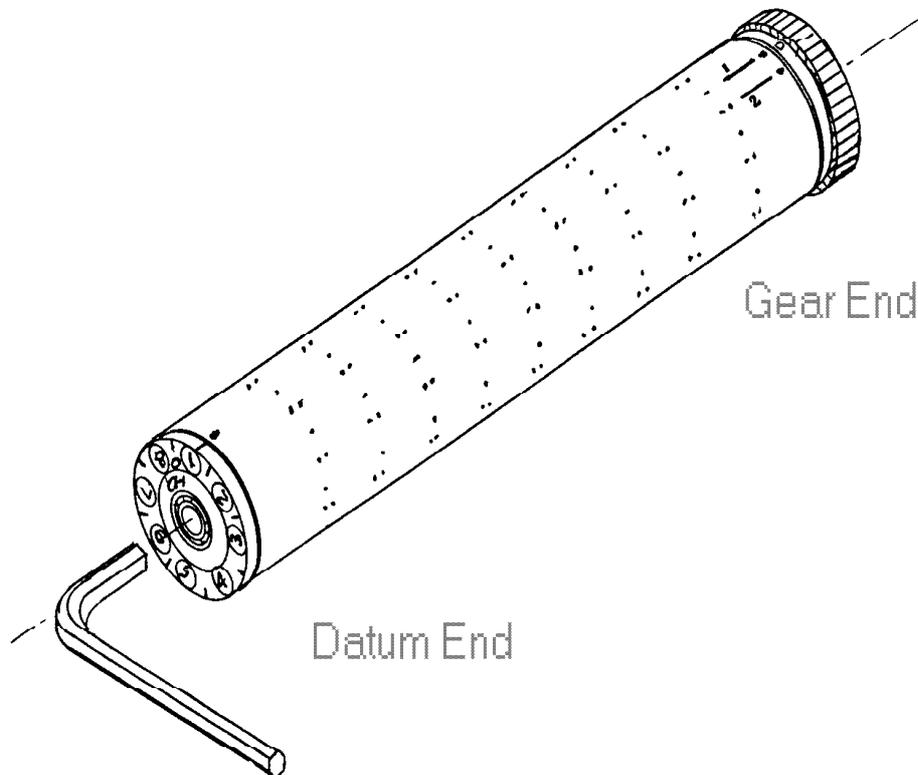
1.0 - Step by Step Instructions for Changing Trays

- 1) Prepare drum
- 2) Adjust Seeder height if necessary
- 3) Set guide width if necessary
- 4) Adjust first row position
- 5) Set row pre-set counter
- 6) Set tray pitch
- 7) Set up for seed (Section 2)
- 8) Try a test run (2.5)

1.1 - Preparation & Drum Removal

- i) Remove the oscillating seed tray (then go to step v). If a rear roller is fitted remove the seed valley end seals (then go to step ii).
- ii) Undo the clamp screws from the curtain tubes and draw curtain tubes out from the outboard end plate.
- iii) Withdraw the tension spring wire from the tensioner shaft if fitted.
- iv) The roller should now swivel down away from the drum.
- v) Undo the two retaining screws and withdraw the outer drum mounting post, whilst supporting the drum with the other hand.
- vi) Carefully withdraw the drum from the front of the seeder. Check that the 'O' ring seals are in position at the inboard end of the drum (gear end).

1.2 - Duplex Drum Preparation



1.2.1 - To change rows

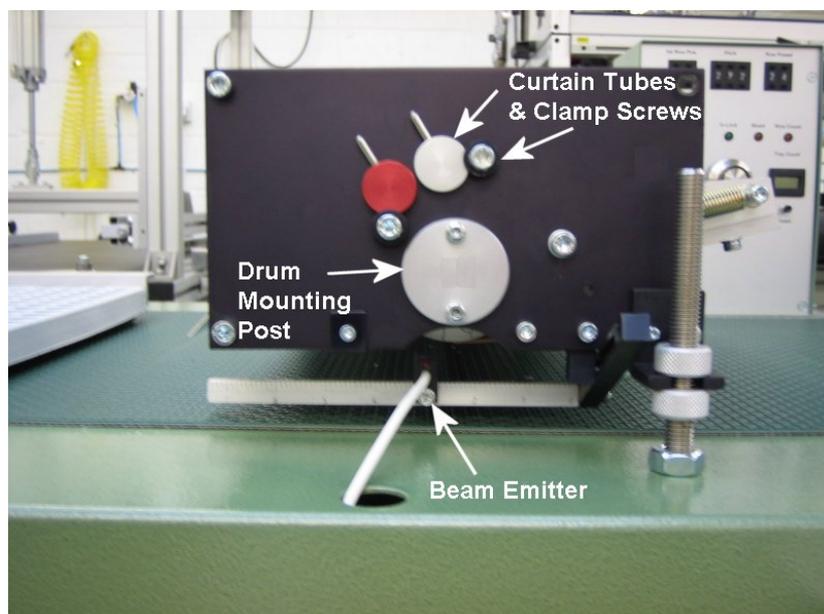
- i) Locate a 5mm A/F hex key in the datum end of the drum as indicated, and loosen the cap head screw one turn only.
- ii) Align the mark at the gear end with the line on the drum surface to connect the appropriate line of holes, and tighten the cap head screw.

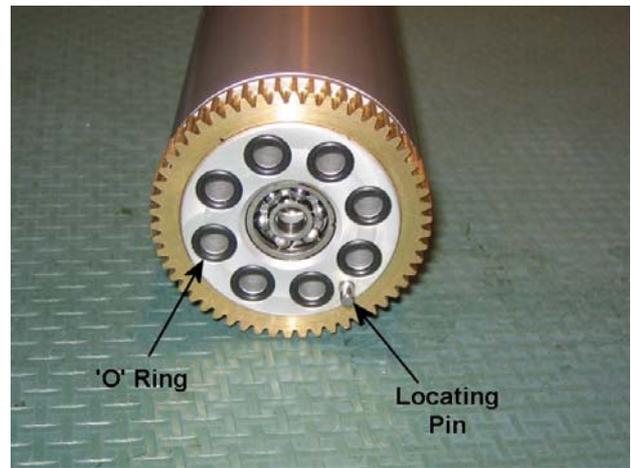
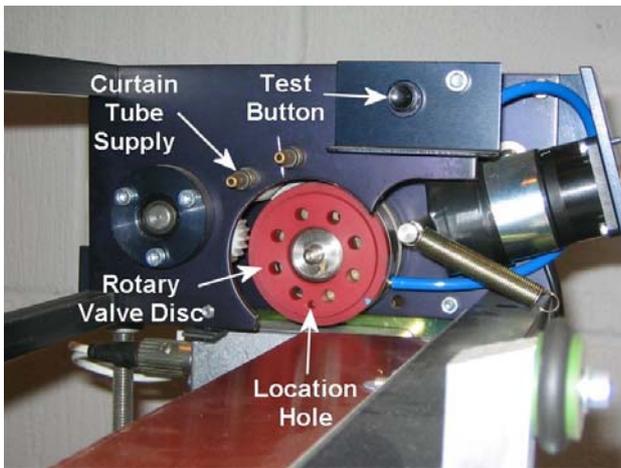
1.2.2 - Timing Marks

The timing marks on the datum end of the drum numbered 1 to 8 correspond to the primary line of holes (as indicated on line 1 of the drawing). When the secondary holes (line 2) are used, the timing marks between the numbers should be used.

1.3 - Drum Fitting

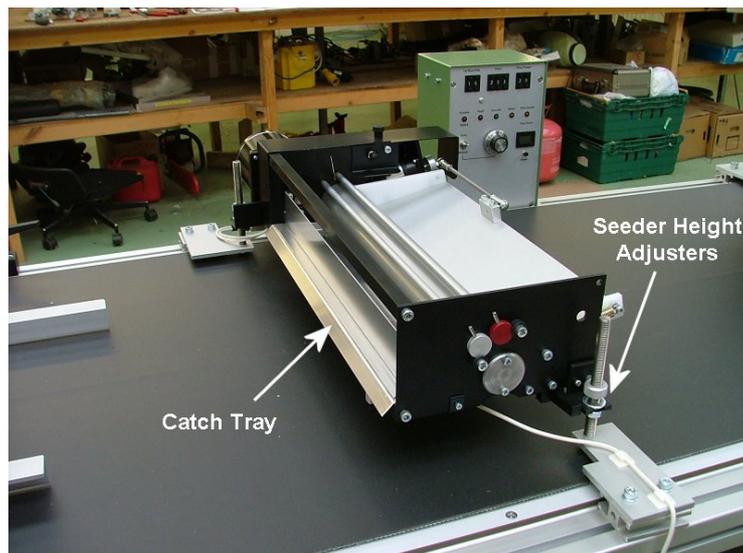
- i) Select the required drum and curtain tubes. Ensure that the 'O' ring seals and location peg are correctly fitted to the inboard end of the drum. Also check that the bearings are fitted into each end of the drum.
- ii) Slide the drum into the front of the seeder (gear end first), making sure that the drum location peg engages with the correct hole in the rotary valve.
- iii) Line up the outer drum mounting post and engage in the outer end of the drum. Note that pressure is required to overcome spring forces before the drum mounting post will seat flush with the outer end plate.
- iv) Fit the two screws to the mounting post and tighten.
- v) If fitted, lift the roller into contact with the drum and refit the tension wire to the end of the tensioner shaft. Hook the tensioner wire over the drum mounting post. Alternatively, refit the oscillating seed tray.
- vi) Identify the curtain tubes. The one with two rows of holes fits in the lower position in the end plate, and the one with one row fits into the upper position in the end plate.
- vii) Slide the curtain tubes into position and connect to the air pipes at the inboard end.
- viii) Refit the curtain tube clamps and fit the screws finger tight. The indicating pins should be pointing radially outwards from the centreline of the drum mounting post. Tighten the screws.





1.4 - Adjusting Seeder Height

Adjust the knurled lock nuts on the seeder mounting studs so that the drum is about 1/4" (6mm) above the tray. Make sure that the seeder is level in both directions before tightening upper locknuts. If the top surface of the trays are brushed clean, then seed placement will be more accurate if the clearance is reduced to 1/8" (3mm).

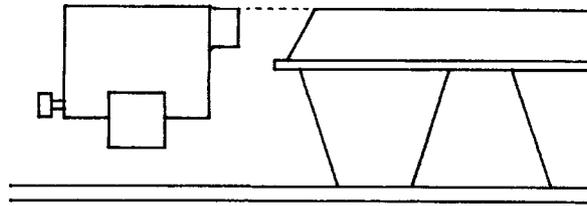


1.5 - Setting Guide Width

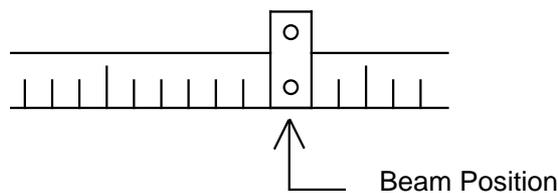
The tray guides should be adjusted so that the tray is guided centrally and squarely past the drum. Make sure that the tray cells line up with the pickup holes in the drum. It is best to allow about 0.04" (1mm) side float for the trays. Make sure that any variation in tray width does not cause trays to stick between the guides.

1.6 - Setting Beam

- i) Set the position of the beam as in the sketch below, so that the beam is broken by the top portion of the tray. The top of the beam housing should be flush with the top of the tray.

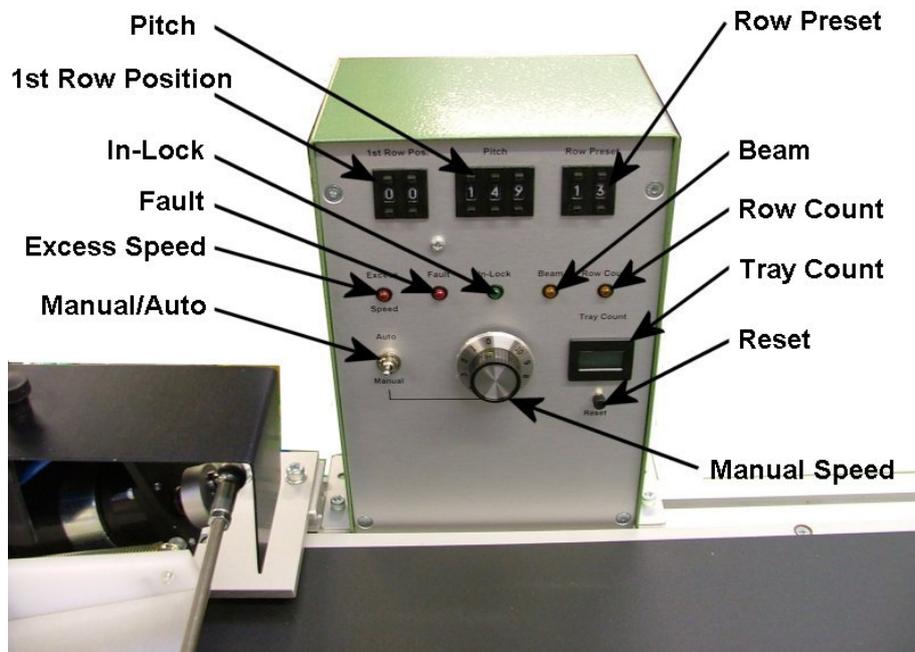


- ii) Set beam longitudinally. Normally, this will remain in position 3,



1.7 - Setting the Row Pre-set Counter

This is set on the Digital Control Box to the number of rows in the length of your tray. When the beam is broken the drum will start to rotate, and it will stop after the number of rows you have set have been sown.



1.8 - Adjusting the Belt/Drum Speed to give the Correct Pitch

Look up the settings for the tray you are using in the table below, and make adjustments to the first row and pitch controls. If there are any discrepancies in the settings, or the trays you are using are not listed, then take the following steps:

Standard Tray Settings

TRAY	1ST ROW POSITION	PITCH	ROW PRE-SET	BEAM
L-200	10	222	20	3
L-288	10	265	24	3
L-392	08	310	28	3
L-512	12	356	32	3
L-800	22	458	40	3
PP-576	12	365	32	3
PP-286	08	260	22	3
PP-180	08	205	18	3

NB: These settings are only a guide - small variations will occur between individual machines.

- i) Mark the side of a tray with lines that correspond to the centre of the cells.
- ii) Select a pitch from the table, which is similar to the trays you are using.
- iii) Start the conveyor at a slow speed, and load the tray on the belt.
- iv) Look at the datum end of the drum and watch the timing marks as the tray passes through. If the drum moves too slowly relative to the tray, increase the pitch control number. If it moves too fast, reduce the number.
- v) An adjustment may also be necessary to the first row position. Setting this control to a higher number will give a longer delay before the first row is dropped. Setting to a lower number will give a shorter delay.
- vi) When you have reached the exact setting, write it down for future reference!

1.9 - Fitting the Seed Valley End Seals

- i) Note that the seed valley end seals and air jets only used on older models, prior to the introduction of the oscillating seed tray.
- ii) The purpose of these seals is to contain the seed within the pickup area (i.e. between the outermost holes of the drum).
- iii) Clip the seals to the curtain tubes, and make sure they fit snugly into the seed valley. Always remove them after sowing to prevent the clip arms losing tension.
- iv) The Air Jets blow gently onto the seals to prevent seeds creeping under them. There is a regulator to adjust the air flow.

SECTION 2 - SETTING UP FOR SEEDING

2.0 - Step by Step Instructions for Changing Seed

- 1) Change the drum if necessary (Section 1)
- 2) Set cleaning air
- 3) Set release air
- 4) Set vacuum
- 5) Set curtain air
- 6) Try a test run

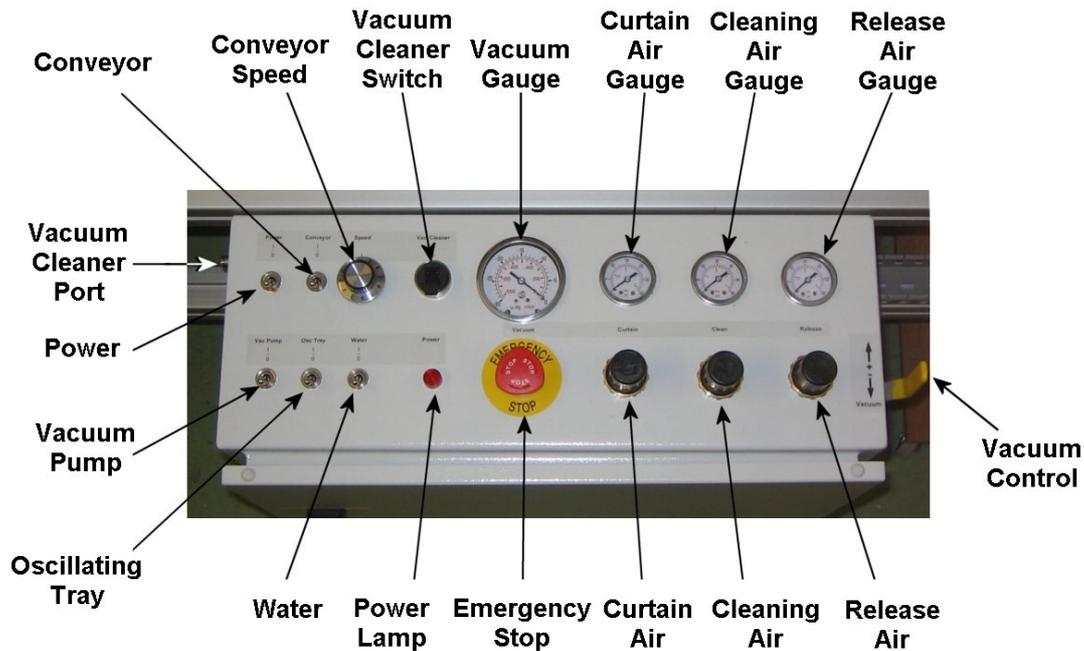


Table of Pressure and Vacuum Settings

SEED	DRUM HOLE SIZE	VACUUM ("Hg)	CURTAIN AIR (PSI)	CLEANING AIR (PSI)	RELEASE AIR (PSI)
Ageratum	0.3mm	5	10	40	3
Alyssum	0.3mm	4	14	40	3
Begonia Pills	0.3mm	5	7	40	3
Cineraria Maritima	0.3mm	4	10	40	3
Impatiens	0.3mm	8	8	40	3
Nicotiana	0.3mm	3	14	40	3
Pansy	0.3mm	10	7	40	3
Petunia	0.3mm	3	5	40	3
Salvia	0.3mm	12	6	40	3
Viola	0.3mm	6	7	40	3

NB: These settings were determined from trials using a 0.3mm drum with Landmark 512 plug trays (16 rows across). Allowances would have to be made for different seed varieties, and tray sizes.

2.1 - Setting Cleaning Air

This is the air which purges the hole after the seed discharge. It is normally set to 40 psi (2.7 bar) but may be increased if very dirty seed is used.

2.2 - Setting Release Air

This air releases the seed from the drum at around bottom dead centre (the 6 o'clock position). This should be set according to the table. If too high a pressure is used, misplacement of the seed on the growing medium could occur. Too low a pressure will result in the seed being scraped off by the lower scraper blade and this could result in seed damage. The setting has to be made at operating speed.

2.3 - Vacuum Control

The vacuum is regulated by the valve on the side of the control box. Pushing the lever forward increases vacuum, pulling it back reduces vacuum. The larger or heavier the seed, the more vacuum is required.

2.4 - Setting Curtain Air

Air holes in the curtain tubes provide jets of air which are directed onto the passing seeds to help singulate any multiple pickups. The force of these jets is adjusted by the pressure regulator on the control panel. To start with, set this pressure as given in the table. Adjustments may be necessary depending on variety to be sown. Adjust this setting taking care not to blow off any single pickups.

2.5 - Test Run

First, check the seed pickup:

- 1) Place seed in the oscillating tray. Place a tray or container on the conveyor belt, under the drum, to catch the seeds.
- 2) Switch the digital controls to Manual, and set the manual speed to a low setting.
- 3) Switch on the vacuum pump and oscillating seed tray.
- 3) Turn the Curtain Air control to zero.
- 4) Press the Test button for 1-2 seconds and observe the seed pickup.
- 5) If there are seeds missing from some pickup holes, increase the vacuum. If **all** the holes are picking up multiple seeds, reduce the vacuum. Press the test button again, and make adjustments to the vacuum until all holes are picking up seeds.
- 6) Now increase the Curtain air. Press the test button, and observe the accuracy of pickup on the drum after the seeds have passed both pickup tubes. Increase the Curtain air until the best singulation is achieved.
- 7) Return the digital control to Auto.

When all the settings have been made try a test run using a white test tray if possible. If this is not possible lay wet white paper onto an empty tray and run this through the machine, having made sure that the paper will not touch the underside of the drum. With the conveyor set to slow, observe the seed falling onto the test tray. If the first row is released too early, increase the first row

position setting. If it falls too late, reduce it. Check the seed is falling into the centre of each cell. If the pitch is incorrect, make adjustments to the pitch control.

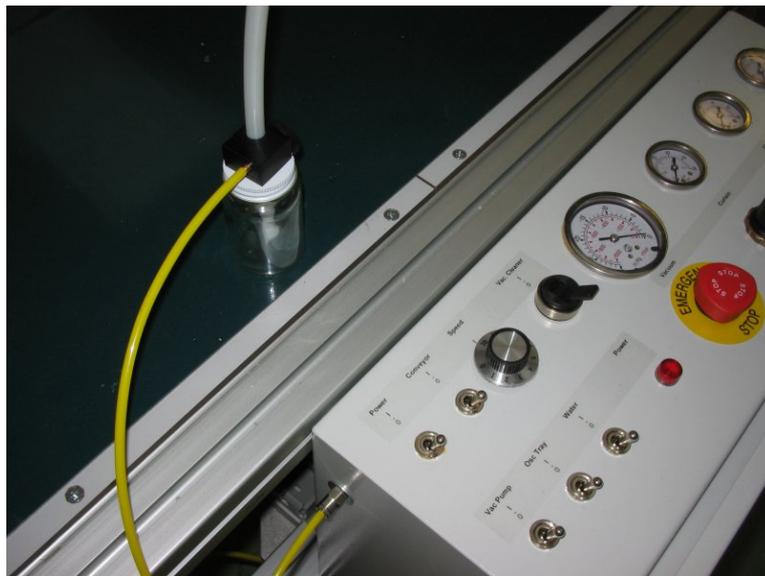
Always leave a 35mm (1½") gap between trays to allow beam to reset and pick up on the leading edge of the following tray.

2.6 - Tray Counter

The tray counter is positioned on the front of the digital control panel. This counts the trays as they pass under the seeder. A reset button is positioned below it to zero the display. The display is only lit while the conveyor is running.

2.7 - Vacuum Cleaner

This is connected to the adapter in the side of the control box and is controlled by the switch valve. With the compressor connected, seed can be vacuumed from the oscillating tray into the glass jar. When small quantities of seed are left in the tray, they should be swept to one end with an artist's paintbrush, and collected. Running the oscillating tray while vacuuming will help to remove the last remains of seed.



SECTION 3 - MAINTENANCE, TROUBLESHOOTING AND A DESCRIPTION OF CONTROLS

3.0 - Maintenance

3.0.1 Scraper Blade

The thin Tufnol plate has several purposes. One is to act as a deflector plate to prevent the jets of hole cleaning air from disturbing the peat in the trays passing under the machine. It also act as a scraper to prevent pieces of seed and other debris, which may become attached to the face of the drum, passing between the drum and tray and being crushed. Should the scraped debris contain pieces of grit which become embedded in the Tufnol, they may damage the thin hard surface of the drum if they are left in for a long time. Periodically the Tufnol plate should be removed and the leading edge cleaned. Check that any grit is removed.

3.0.2 Emitters & Receivers

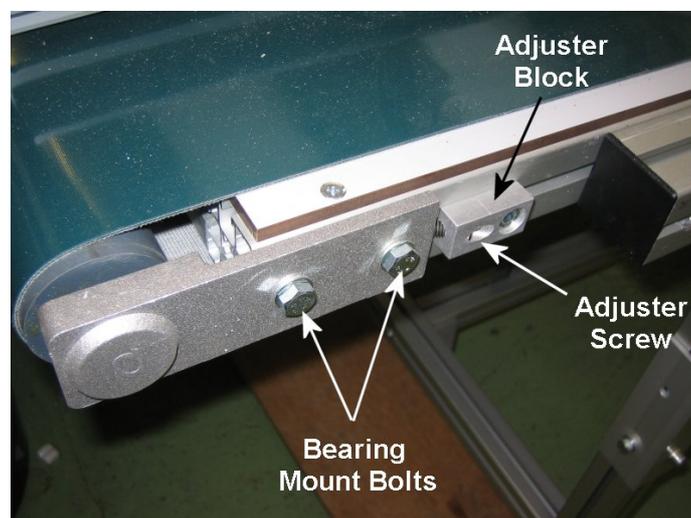
Clean the beam emitter and receiver regularly to prevent a build up of soil and dust on the lenses. Blow out with a pipe connected to the vacuum cleaner outlet to remove the majority of the dirt, and finish by using a cotton swab or paper tissue to polish the lenses.

3.0.3 Conveyor Belt Tensioning, Tracking, and Cleaning

The conveyor belt has a central tracking rib, and therefore no adjustment for tracking is required. The conveyor belt tension is set at the factory. Belt tensioning may be required after a long period of running. Be aware that the belt may also shrink after a time, and cause high loading to the roller bearings.

Tension adjustments are made on the tray entry end roller - **NOT** the end near the motor, as this will effect the chain drive tension. Slacken the bearing mount bolts, and make adjustments with the adjusting screws. Adjust even amounts each side. If sufficient adjustment is not available on the adjusting screws, the adjuster block can be loosened and moved as required. Don't forget to tighten the bearing mount bolts when finished.

Periodically check the conveyor rollers for an accumulation of dirt. This has the effect of increasing the belt tension, so regular cleaning is required.



3.0.4 Lubrication of Conveyor

The only items to be lubricated on the conveyor are the chain and sprockets, which should not be allowed to become dry. When the machine is in regular use, monthly visual inspection is suggested. Use a light grease or engine oil. All other conveyor shafts are fitted with sealed ball bearings which require no lubrication.

3.0.5 Lubrication of Seeder

The seeder drum and drive shaft are fitted with ball races and require no lubrication. The rotating part (red disc) of the rotary valve is made of low friction material but requires cleaning and a trace of oil wiped onto the valve face once a month or so, dependant on use.

3.0.6 Vacuum Pump Filters

Over a period of time dust and dirt accumulate in the vacuum pump filters. The two internal filters can be removed and cleaned in warm soapy water, allowed to dry, and re-fitted. The external exhaust filter is not serviceable, and should be replaced if pump performance deteriorates.

3.0.7 Cleaning the Outer Surface of the Drum

- i) It is important that the drum surface and holes are clean. Any oily or dusty deposits will cause seed to stick to the surface and impair performance. Dirt in the holes picked up during storage of the drum will also cause problems with pickup.
- ii) Using an oil free spirit (methylated spirit or pure alcohol are suggested) on paper towelling, wipe the surfaces of both the roller and the drum. This is best achieved whilst the machine is running, without seed. Use the manual test button to rotate the mechanism with the digital control set to manual. Allow excess spirit time to evaporate.
- iii) Stop the drum and clean out the holes with the cleaning wire provided.

3.0.8 Cleaning the Internal Passageways of the Drum

The internal galleries of the drum can be cleaned by removing the drum ends completely. Undo the screw in the datum end 10 turns, and loosen the datum end by pushing on the gear end. Undo the screw completely, remove the datum end, and withdraw the gear end and tie rod.

The galleries can now be cleaned with a cleaning brush. The gear end ports can be cleaned with a cotton bud.

When reassembling the drum, take care to align the number 1 timing mark with the dimple on the drum surface. See figure in section 1.3.

Also see section 4.3.2 regarding maintenance of Oscillating Seed Tray.

3.1 - Troubleshooting

3.1.1 Drum stops and fault light comes on

The control system has a fault. Switch power off and try again. If fault persists, check that the encoder is turning freely. This 'fault' will also occur if the manual test button is pressed without the conveyor running.

3.2 - Description of Controls

First Row Position - Determines the position that the first row of seed is dropped. Increasing this setting will drop the seed later, or closer to the rear of the tray.

Pitch - This is the setting for the longitudinal pitch of the tray. Increasing this setting will drop the seeds closer together.

Row Pre-set - This should be set to the number of cells in the length of the tray. If you are double sowing into the tray, this should be set to twice the number.

Excess Speed Light - When flashing, shows that you are trying to run the conveyor too fast for the pitch setting you are using. Reduce the belt speed.

Fault Light - When lit, shows that a fault has occurred. Switch off the power to reset the system. If the fault recurs, contact your dealer.

In-Lock - When lit without flashing, shows that the system is operating correctly and that belt and drum are synchronised.

Beam - Shows the state of the beam. When lit, beam is established. When off, beam is broken.

Row Count - Flashes for each row that is sown. It's purpose is mainly for fault finding.

Auto/Manual - In the Auto position the drum is linked to the belt speed. In the manual position it is linked to the manual speed control. **Note that the drum will not run when a tray passes under the seeder if the switch is set to manual.**

Manual Speed - Sets the speed of the drum when the manual switch is selected, and the test button is pressed on the seeder. Useful for setting up the vacuum, etc., and for emptying the seed with the vacuum cleaner. Don't forget to switch it back to Auto when seeding!

Tray Count - Displays the amount of trays that have passed under the seeder.

Reset - Resets the tray counter to zero.

Emergency Stop - The Emergency Stop Button on the top of the main control box cuts off all power to the machine. Press to stop - twist to reset.

Air Shut Off - The shut-off valve is on the inlet air filter. Twist the knob to turn off the air to the system when carrying out maintenance work and adjustments.

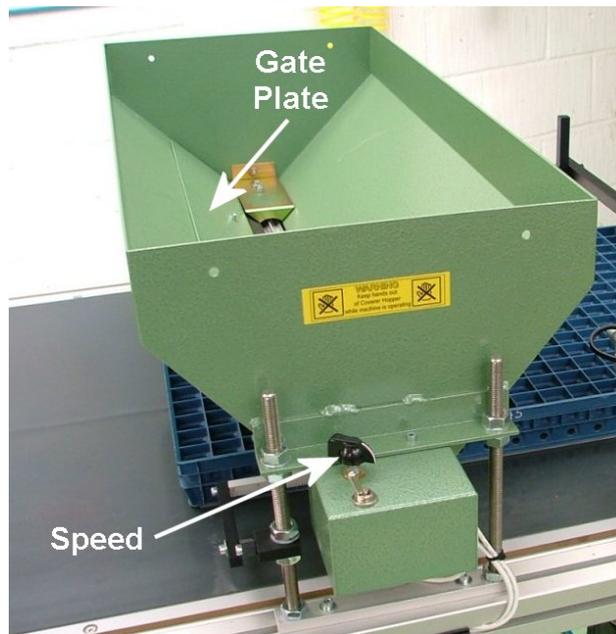
SECTION 4 – ACCESSORIES

4.1 Vermiculite Coverer

There are only two adjustments for the Vermiculite Coverer - the speed of the motor, and the height of the gate plate. Never make adjustments to the gate plate while the machine is running.

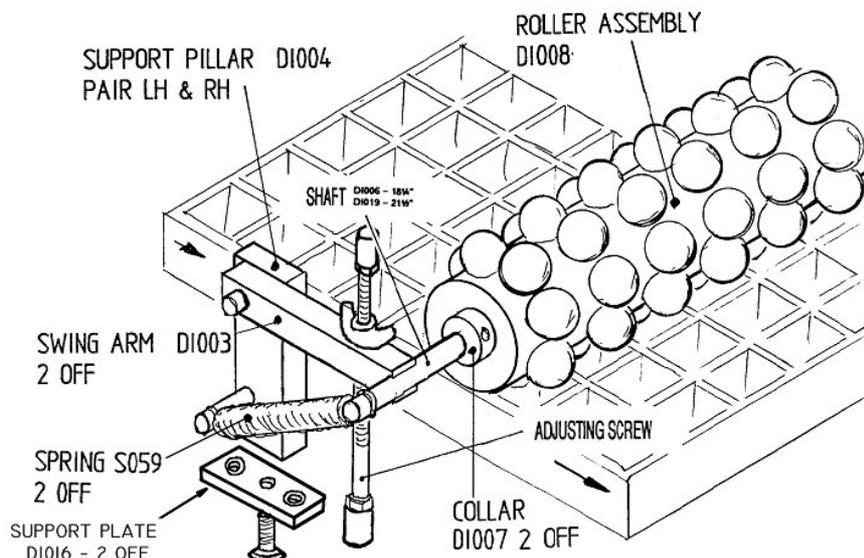
The gate plate should generally be set according to the grade of vermiculite used. It should be set higher (more open) for coarse grades, and lower (more closed) for finer grades.

The motor speed can then be set for the covering thickness required. The motor speed control is the adjusting knob on the coverer itself. Increasing speed will increase the covering thickness.

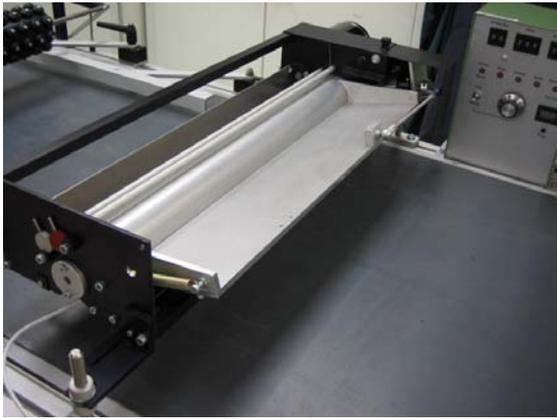


4.2 Roller Dibblers

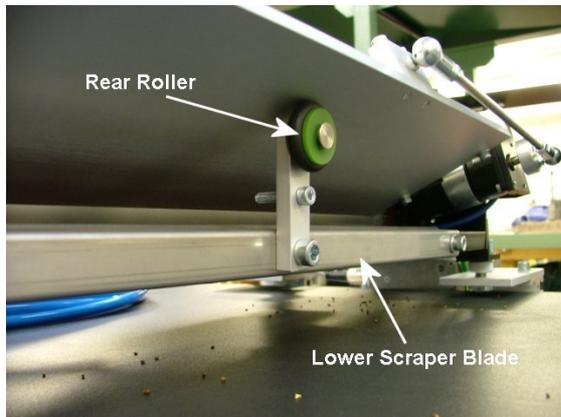
Adjustment of the roller dibbler is fairly straightforward. Turn the adjusting screws to adjust the roller height so that the bottom of the roller just touches the surface of the plug tray. Position the collars so that there is some side 'float' as the tray goes under the roller.



4.3 Oscillating Seed Tray

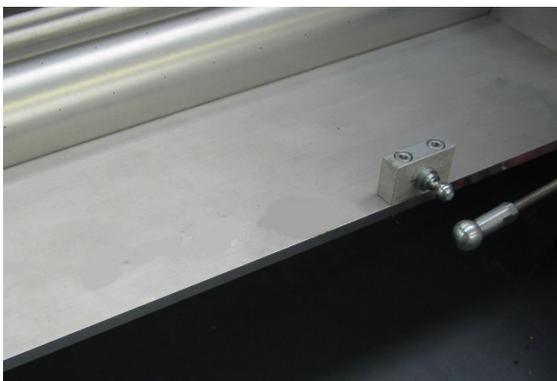


The oscillating seed tray is powered by a small 12 volt geared motor mounted at the drive end of the seeder. An offset crank connects it to the tray via a rod linkage with ball joints. The tray is held against the surface of the tray with springs, and is supported at the back end by a roller. The side-to-side motion created will agitate the seeds in the tray, making them pick up more easily. The mating face of the tray base to drum is covered with a PTFE impregnated fabric material to prevent wear to the surfaces. The sides are made from nylon.

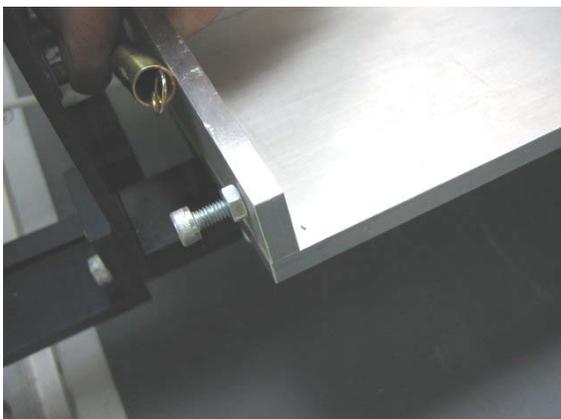


The rear of the tray can be tilted to give a greater angle when sowing small quantities of seed.

4.3.1 Tray Removal



Remove the ball joint where it connects to the tray..

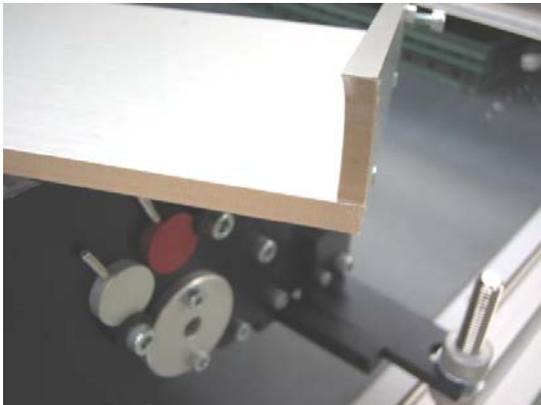


Remove the springs from each end by unhooking them from the screws. The springs will remain in place on the inner mounting posts.



Lift off the seed tray.

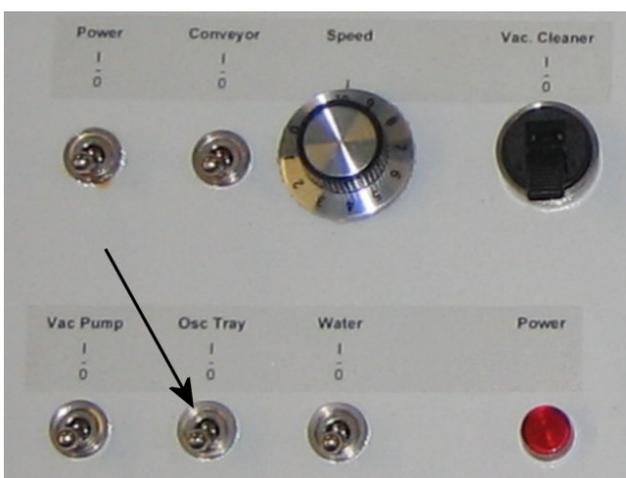
4.3.2 Maintenance



Carefully inspect the fabric covered edges of the seed tray for signs of damage. Under no circumstances use the tray if the fabric is missing or damaged, as it may cause irreparable damage to the drum. Wash the seed tray using warm, soapy water and a soft cloth. Do not use solvents of any kind, as they can remove the adhesive backing of the fabric.

Note that on later machines the curved tray sides are made from nylon, and do not have the fabric covering.

4.3.3 Operation



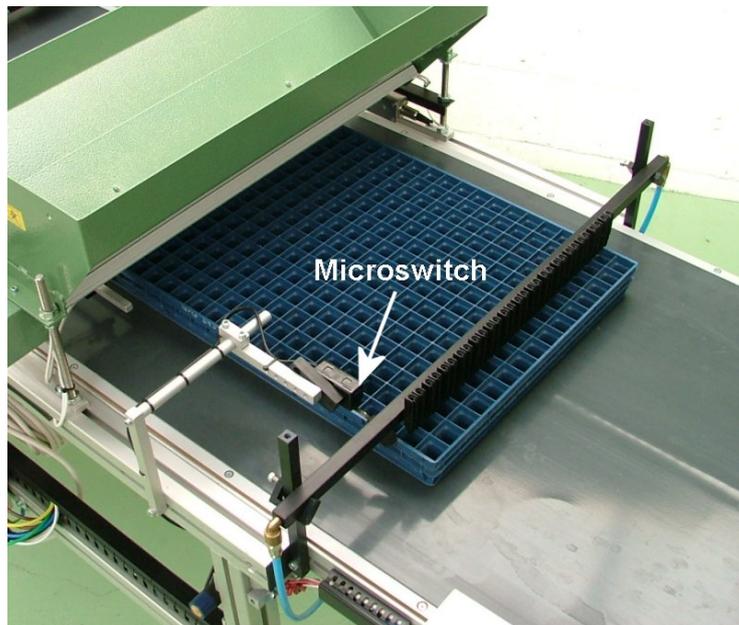
Turn on the seeder power switch on the top of the main control box, and then the Osc. Tray switch. The tray will run until the switch is turned off, or the main power is turned off. Avoid running the tray for long periods without sowing, to preserve the life of the anti-wear impregnated fabric material.

4.4 Watering Bar

The watering bar is controlled by the switch on the top of the main control cabinet, and will operate only while the conveyor is running.

The microswitch starts the watering process when it is lifted by the leading edge of the tray, and stopped when it drops off the back of the tray. With careful adjustment of position, very little run-off will be obtained.

Water flow is regulated by the flow regulator on the solenoid valve, and should be set once the optimum conveyor running speed has been established. Note that if the conveyor speed is increased or decreased, it will affect the volume of water applied to the tray.



SECTION 5 - SPARES KIT LIST AND FINAL ASSEMBLY

5.1 - Spares Kit for Drum Seeder

- 1 Vacuum Cleaner
- 1 3mm Ball Driver
- 1 4mm Ball Driver
- 1 5mm Ball Driver
- 1 Socket Wrench Set
- 1 Cleaning Wires & Pin Vice Holder
- 1 Artist's Paintbrush
- 1 Spare Fasteners Pack
- 1 Spare Fuse Pack
- 1 Instruction Manual

5.2 - Final Assembly of crated Drum Seeder

The new Drum Seeder with heavy-duty conveyor is supplied almost fully assembled. Site the seeder on firm, dry, level ground.

- 1) Remove the top and one side of the packing case. Remove all the internal wooden bracing, securing screws, and cable ties.
- 2) Remove the lower leg frames and central rail from the packing case, and assemble.
- 3) Lift the main conveyor from the packing case, and carefully lower onto the locating pins on the tops of the leg frames. The conveyor is extremely heavy, so several persons are required.
- 4) Loosen the leg joining angles, and slide into position to join the lower legs to the main framework. Tighten the screws.
- 5) Remove the packing material from the shaft encoder (speed pickup) which is located in the cover for the conveyor motor.
- 6) Connect the cable to the mains electrical supply. The plug should be fitted with either a 15 amp fuse for 110v operation or a 7½ amp fuse for 240v operation.
- 7) Connect a suitable air compressor to the air filter, and turn on the tap at the filter inlet. See the Downloads page of our web site for compressor specifications.
- 8) The conveyor and seeder can now be operated. Read this manual thoroughly before operation.

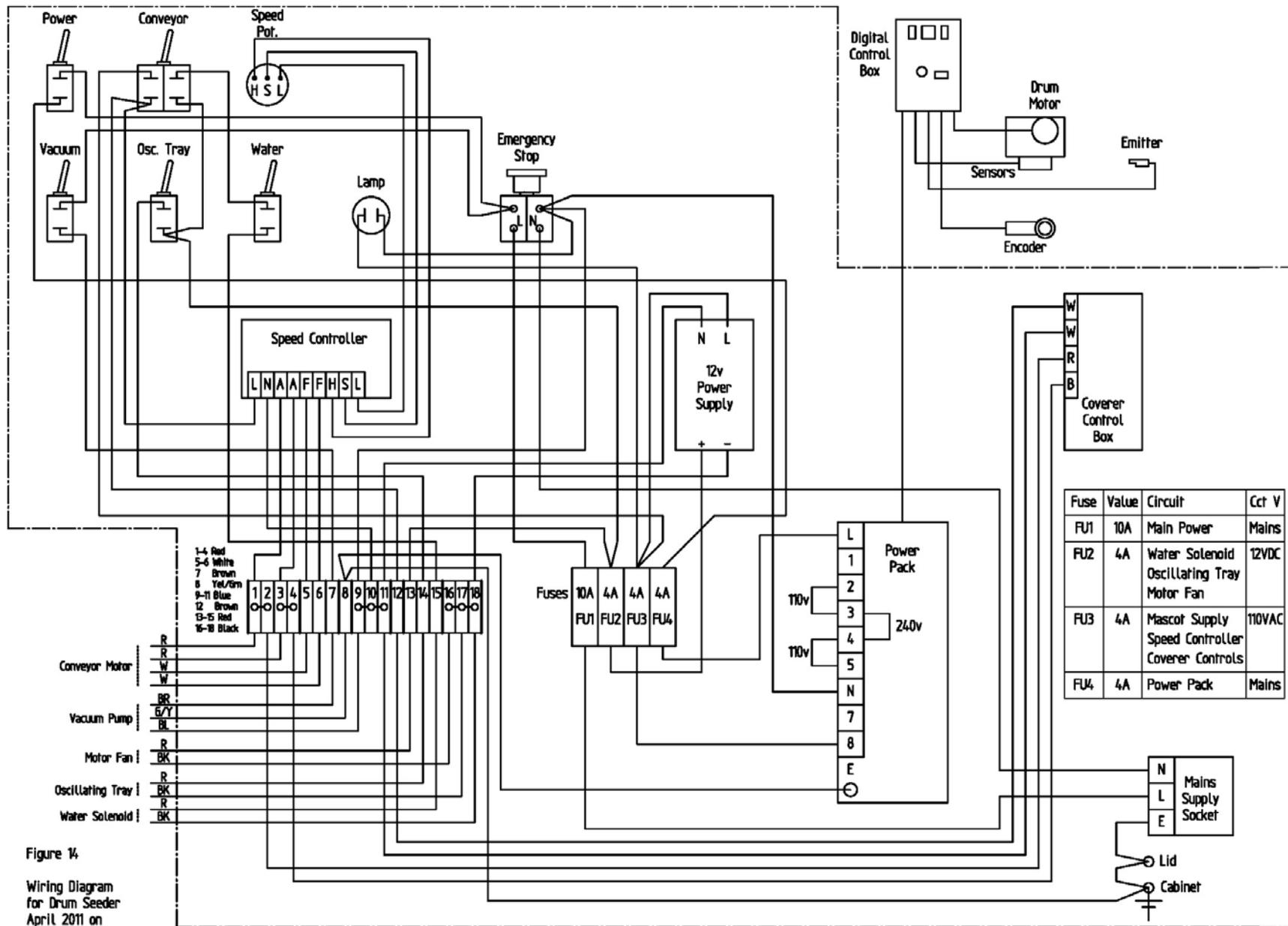


Figure 14
Wiring Diagram
for Drum Seeder
April 2011 on

Hamilton Drum Seeder

Spare Parts Lists and Exploded Views

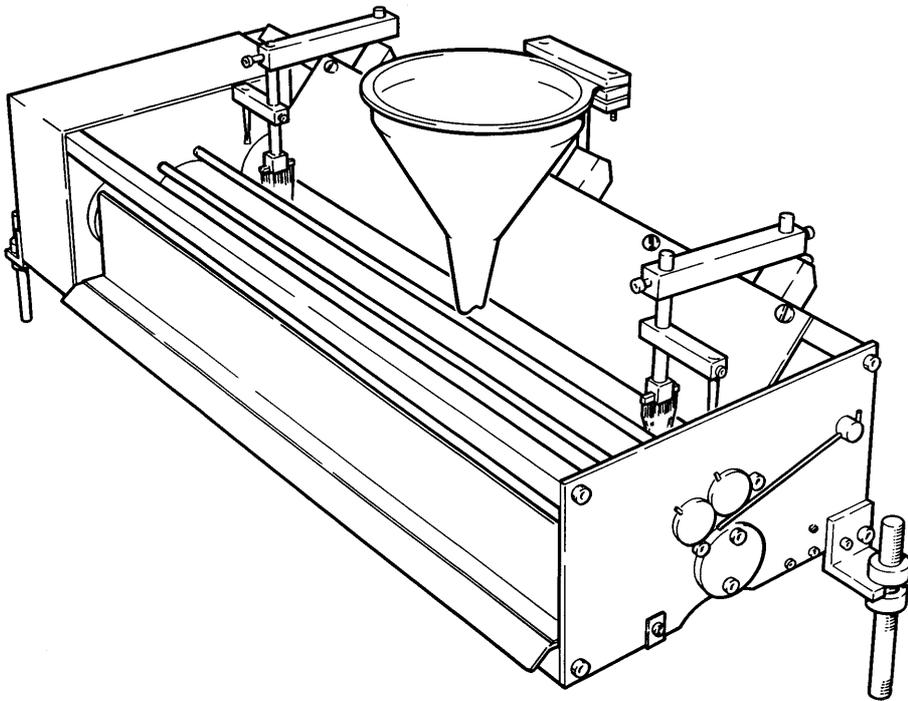
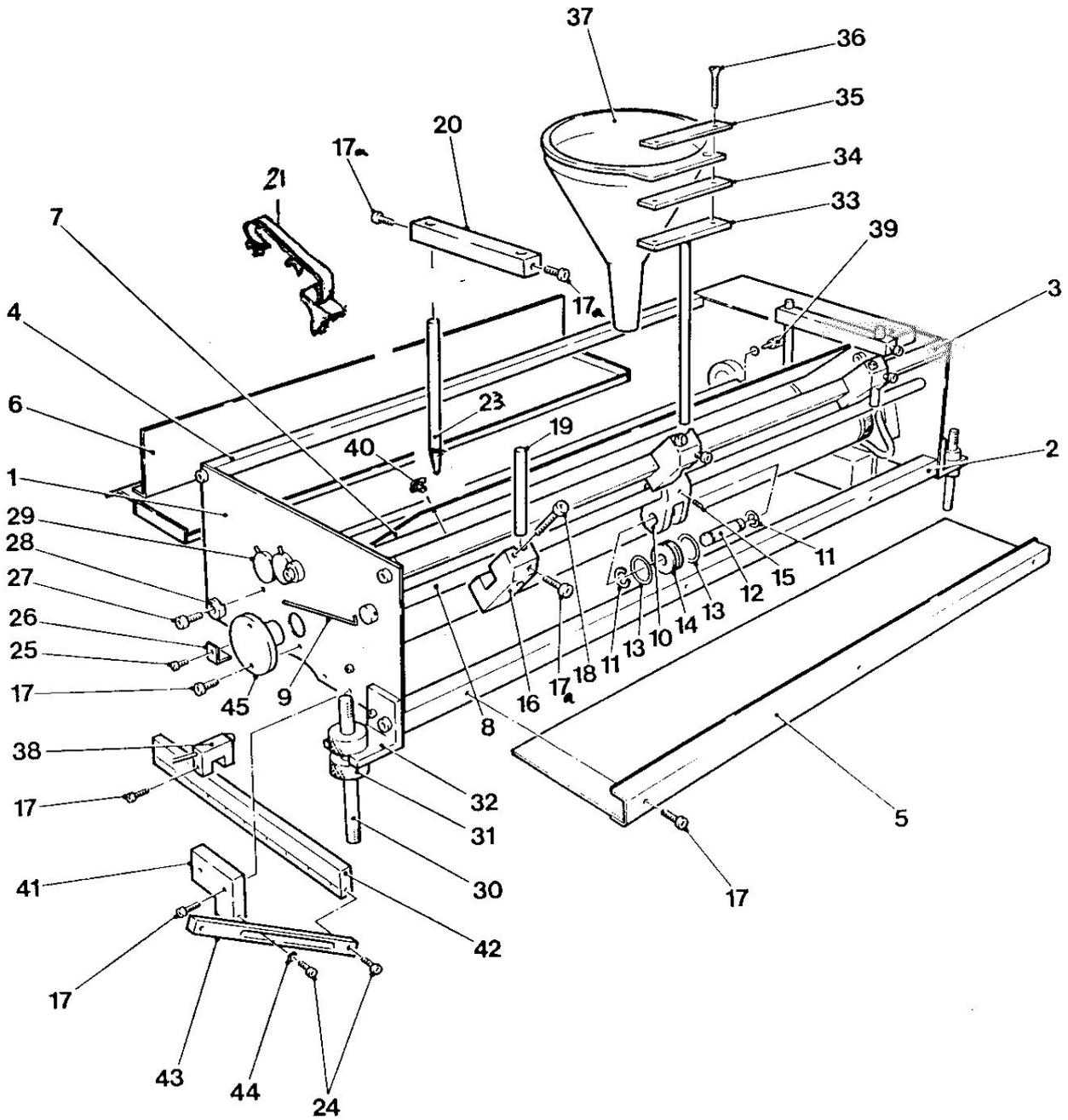


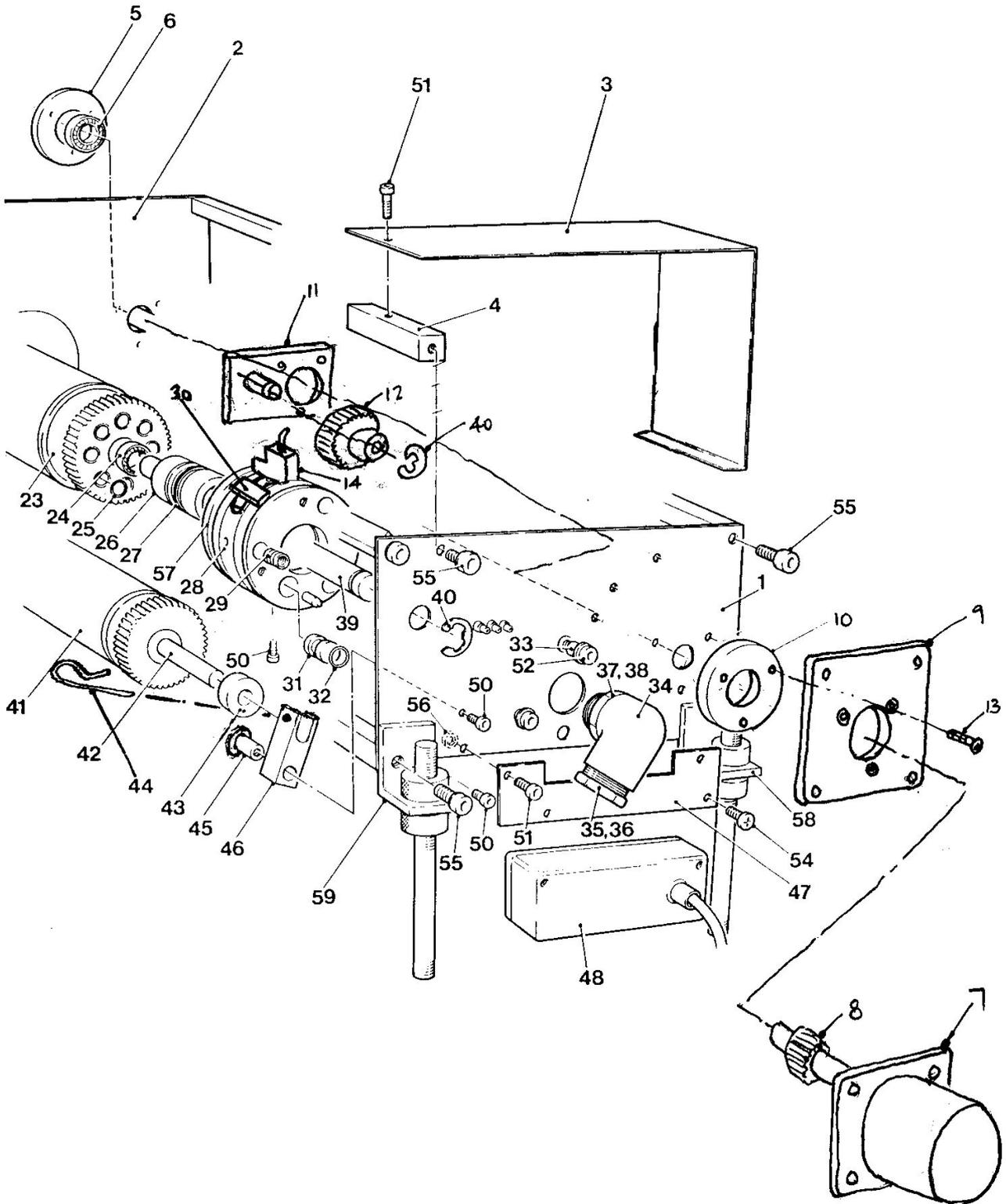
Figure 1



Key to Figure 1

ILLUSTRATION NO.	PART NUMBER	DESCRIPTION
1	DS002	Main Plate (Datum End)
2	DS007	Frame Bar (Rear)
3	DS007	Frame Bar (Rear)
4	DS008	Frame Bar (Front - Long)
5	DS040A	Lower Scraper Blade Assembly
6	DS021	Catch Tray
7	DS039	Upper Scraper Blade
8	DS031	Tension Shaft
9	DS069	Tension Shaft Spring Rod
10	DS032	Tension Fork
11	DS070	E Clip
12	DS034	Tension Roller Pin
13	S035A	O Ring
14	DS033	Tension Roller
15	TA031	M4x 8 Socket Set Screw
16	DS036	Attachment Clamp
17	S136-07	M4x 10 Socket Head Cap Screw
17a	S163	Thumbscrew M4
18	ECC044	M4x 25 Socket Head Cap Screw
19	DS059	Positioning Bar Rods
20	DS052	Brush Positioning Bar
21	DS051V	Seed Valley End Seals (Pair)
23	DS832	Air Jet Tube Assembly
24	S118	M4x 16 Socket Head Cap Screw
25	DS072	M3x10 Socket Head Cap Screw
26	DS035	Catch Tray Support
27	S096	M5x12 Socket Head Cap Screw
28	S023	Clamp
29	DS038	Air Curtain Tube Assembly
30	DS041	Mounting Stud
31	DS042	Level Adjustment Nut
32	DS019R	Support Bracket (RH)
33	DS061/062	Hopper Support Strip and Rod
34	DS064	Hopper Clamp Back
35	DS063	Hopper Clamp
36	S160	M4x25 C'Sunk Socket Screw
37	DS060	Hopper
38	DS704	Emitter Assembly
39	DS038C	Curtain Tube Connector
40	S098	M4x6 Pan Head Screw
41	DS079	Emitter Carrier Mounting Block
42	DS081	Emitter Carrier
43	DS080	Emitter Adjustment Arm
44	DS091	M4 Plain Washer
45	DS017	Bearing Support (Datum End)

FIGURE 2



Key to Figure 2

ILLUSTRATION No.	PART NUMBER	DESCRIPTION
1	DS001	Main Plate (Drive End)
2	DS003	Intermediate Plate
3	DS056	Gear/Solenoid Cover
4	DS010	Frame Bar (Rear-Short)
5	DS037	Bearing Housing (Drive Shaft)
6	DS083	Drive Shaft Bearing
7	DS1026	Stepper Motor Assy
8	DS1012	Drive Shaft
9	DS1009	Motor Mounting Plate
10	DS1010	Motor Mounting Spacer
11	DS1011	Idler Mounting Plate
12	DS1027	Idler Gear
13	S160	M4 x 25 C'sk Head Cap Screw
14	DS1200	Pushbutton and Hall Effect Switch Assembly
23	DS150A	Drum Assembly
24	DS090	¼" Bearing
25	S135-08	O Ring (BS010)
26	DS016	Bearing Support (Drive End)
27	DS087	O Ring (BS018)
28	DS011	Valve Block
29	DS066	Valve Block Spring
30	DS071	Rotary Valve Retaining Clip
31	DS075	Piston Valve Block
32	S135-08	O Ring (BS010)
33	DS047	Valve Block Retainer
34	DS048	Hobbs Elbow Adapter
35	DS351	½" Tubing Nut
36	DS352	½" Tubing Sleeve
37	DS049	Hobbs Coned Locknut
38	DS050	Hobbs Seal
39	DS031	Tensioner Shaft
40	P127	E Clip
41	DS025A	Roller Assembly
42	DS028	Roller Shaft
43	DS029	Roller Shaft Collar
44	DS826	"R" Clip
45	DS821	Swing Arm Pin
46	DS820	Roller Shaft Swing Arm (Clip Type)
47	DS501	Receiver Mounting Plate
48	DS500	Receiver Assembly
49	DS094	M4 x 10 C'Sunk Slotted Screw
50	DS072	M3 x 10 Socket Head Cap Screw
51	S136-07	M4 x 10 Socket Head Cap Screw
52	S118	M4 x 16 Socket Head Cap Screw
53	TA031	M4 x 8 Socket Set Screw
54	DS535	M4 x 12 Posihead Screw
55	S099	M5 x 16 Socket Head Cap Screw
56	DP047	M4 Full Nut
57	DS1024	Rotary Valve Disc Assembly
58	DS1008	Extended Support Bracket
59	DS019L	Support Bracket (LH)

