

**The
HAMILTON NATURAL SEEDER
Operator's Manual**

Issue 11

05/12

HAMILTON DESIGN LTD

Green Lane, Littlewick Green, Maidenhead, Berks. SL6 3RH England.

Tel: +44 (0)1628 826747 Fax: +44 (0)1628 822284

E-mail: service@hamilton-design.co.uk

Website: www.hamilton-design.co.uk

**EC Machinery Directive
Declaration of Conformity**

We hereby certify that the following machinery complies with all the relevant Essential Health and Safety Requirements of the EC Machinery Directive 89/392/EEC as amended and the National Laws and Regulations adopting this directive.

Machine Description:	The Hamilton Natural Seeder
Product Code:	S1802, S1802-14 and S1802-20
Serial Number
Name of Manufacturer:	TW Hamilton Design Ltd
Address:	Nethercliff, Green Lane Littlewick Green Maidenhead, Berkshire SL6 3RH, U.K.

Harmonised standards applied:
EN292 - Safety of Machinery - Basic Concepts - Parts 1 and 2
EN953 - Guarding
prEN983 - Pneumatics
prEN1050 - Safety of Machinery - Risk Assessment
A technical construction file for the machinery is retained at the above address.

Signed: 
Name: **Richard J Hamilton**
Position: **Director**
Date: **1st July 1995**

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00.1 SAFETY NOTES

READ THIS FIRST

- 1) 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.
- 2) During all maintenance, dismantling, and adjustment, disconnect the mains air and electricity supplies (where appropriate) from the machine.
- 3) The machine should never be operated without all guards and covers being securely fixed in position.
- 4) 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.
- 5) This machine is designed for the specific purpose of sowing seeds, and should not be put to any other use.

01.1 Quick Start

PROCEDURE FOR SETTING THE HAMILTON NATURAL SEEDER

For additional details see Section 04.0 & 05.0

Put a single layer of seeds in the stainless steel seed tray and switch the vibration position to 'test'. Adjust the level of vibration so that the seeds appear fluid. Make sure that the machine is level by adjusting the large knurled knob on the right hand side, the seed should flow evenly along the length of the seed tray. Tilt the seed tray back and forth so that the seed flows down to the seed tray bend line and presents a line of seeds at this point ready for pick-up (see Fig.B).

- 1) Consult the table for settings for the seed you are using. If the seed is not listed, choose a seed of similar size and weight. Loosen the wingnut and set the seed size position as shown in the table (see Fig.A). Loosen the cap screw in the centre of the piston stop control and set to the figure shown. Tighten both controls.
- 2) Set the vacuum as shown in the table. Manually push the nozzle bar down over the seed until some nozzles pick up seed. Ease the nozzle bar back to the top position, checking that the seed passes the profile bar (or strip) and is not wiped off. If the seeds are wiped off by the profile bar, increase the seed size setting until the seeds clear the bar.
- 3) Push the nozzle bar down as far as it will go. If the nozzle tips go right into the seed (below the level of the seed) then reposition the piston stop slightly clockwise from the set point. Repeat until the nozzle tips stop just above the vibrating seed (see Fig.B).
- 4) Press the green push button on top of the control cabinet and make a visual inspection of the pick-up. If there are misses then increase the vacuum setting. If there are consistent doubles, reduce the vacuum. Repeat this process until the best result is achieved.
- 5) Try a dry run with a blank empty tray, white if possible, and make any final adjustments.
- 6) When all adjustments have been made **MAKE A NOTE OF THE SETTINGS** for future reference.

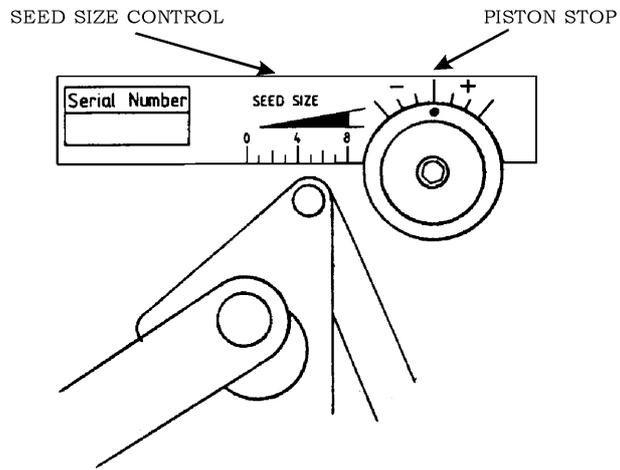


FIGURE A

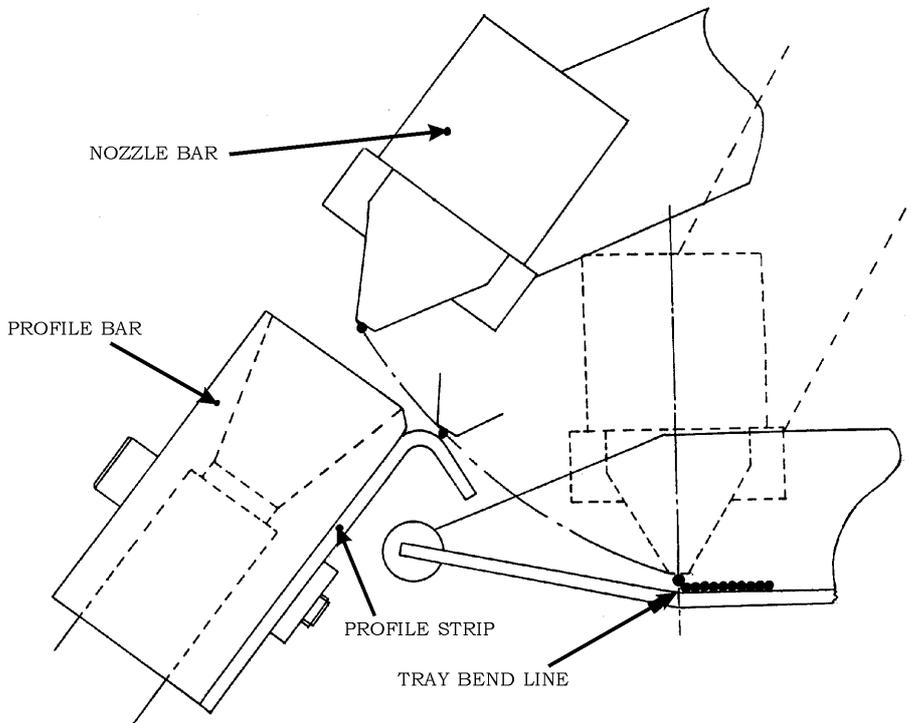


FIGURE B

The following is a guide only. Variations may be necessary, dependent on seed variety and number of nozzles in action. Space has been left for you to fill in your own figures.

Seed	Nozzle Bar Selection *	Venturi Size	Seed Size Position	Piston Stop Position	Vibration Control	Vacuum Setting	Remarks
Ageratum	0.3	Std.	4	0	1.25	18	
Alfalfa	0.3	Std.	4	0	2	10	
Alyssum	0.3	Std.	2	0	1.25	8	
Antirrhinum	0.3	Std.	1	-0.5	1.25	10	
Aster	0.3	Std.	4	+0.5	1.25	25	
Aubrietia	0.3	Std.	2	0	1.25	10	
Begonia	0.14	Std.	1	-1	2	17	Raw seed
Begonia	BEG	Std.	0	0	2	10	BBK
Bellis	0.3	Std.	2	0	1.25	5	
Cabbage	0.6	Std.	8	0	1.5	15	
Calendula	0.6	Std.	8	0	1.25	25	LSC
Carnation	0.3	Std.	6	-2	0.25	20	
Carrot	0.3	Std.	4	-1	2	15	
Celery	0.3	Std.	4	0	1.25	10	
Chives	0.6	Std.	8	-1.5	1.25	15	
Cineraria	0.3	Std.	3	-1	1.25	10	
Cyclamen	0.6	Large	8	0	1.25	30	PW & LSC
Dahlia	0.6	Std.	8	0	1.25	25	UPB
Dianthus	0.3	Std.	8	-1	1.25	10	
Gerbera	0.3	Std.	4	-2	1.25	30	UPB
Impatiens	0.3	Std.	4	0	1.25	6	
Lettuce	0.3	Std.	0	0	1.5	15	

Seed	Nozzle Bar Selection *	Venturi Size	Seed Size Position	Piston Stop Position	Vibration Control	Vacuum Setting	Remarks
Lobelia	0.3	Std.	1	0	1.25	10	Clumps of 4-5
Marigold	0.3	Std.	4	0	1.5	15	UPB - Clipped seed
Nemesia	0.3	Std.	3	-1	1.25	10	Cleaned seed
Nicotiana	0.3	Std.	2	-1	2	15	BR
Pepper	0.6	Std.	4	0	1.5	20	PD
Stocks	0.3	Std.	4	0	1.25	14	
Sweet William	0.3	Std.	3	-1	1.25	14	
Tomato	0.6	Large	8+	-1	2.25	15	PD - Rubbed seed
Verbena	0.3	Std.	5	0	1.5	24	
Viola	0.3	Std.	4	0	1.25	16	

Abbreviations:

- BBK Use Begonia Bar Kit
BR Use Blue Low Vacuum Pipe (S082)
LSC Use Large Seed Cups (S016S7). See Section 06.1
PD May require Packing Disc (S133). See Section 06.2
PW Use Packing Washer under Nozzle Bar. See Section 06.1
UPB Use Universal Profile Bar Kit (S012-14K).
On later machines (1991 on) these seeds can be sown with the large discharge tubes provided as standard.

*** Please note:**

When using Needle Nozzle Bar, substitute the "Nozzle Bar Selection" sizes as follows:

- 0.14mm use 0.1mm
0.3mm use 0.25mm
0.6mm use 0.5mm

For nozzle selection see Section 06.3.

02.1 General Principles

Numbers in brackets refer to air circuit diagram below.

The machine's cycle is started by the trip valve (66) or indexing mechanism. Seeds from the previous cycle are discharged from the nozzle on the pick-up bar (26), by a blast of air passed from a small reservoir in valve (54).

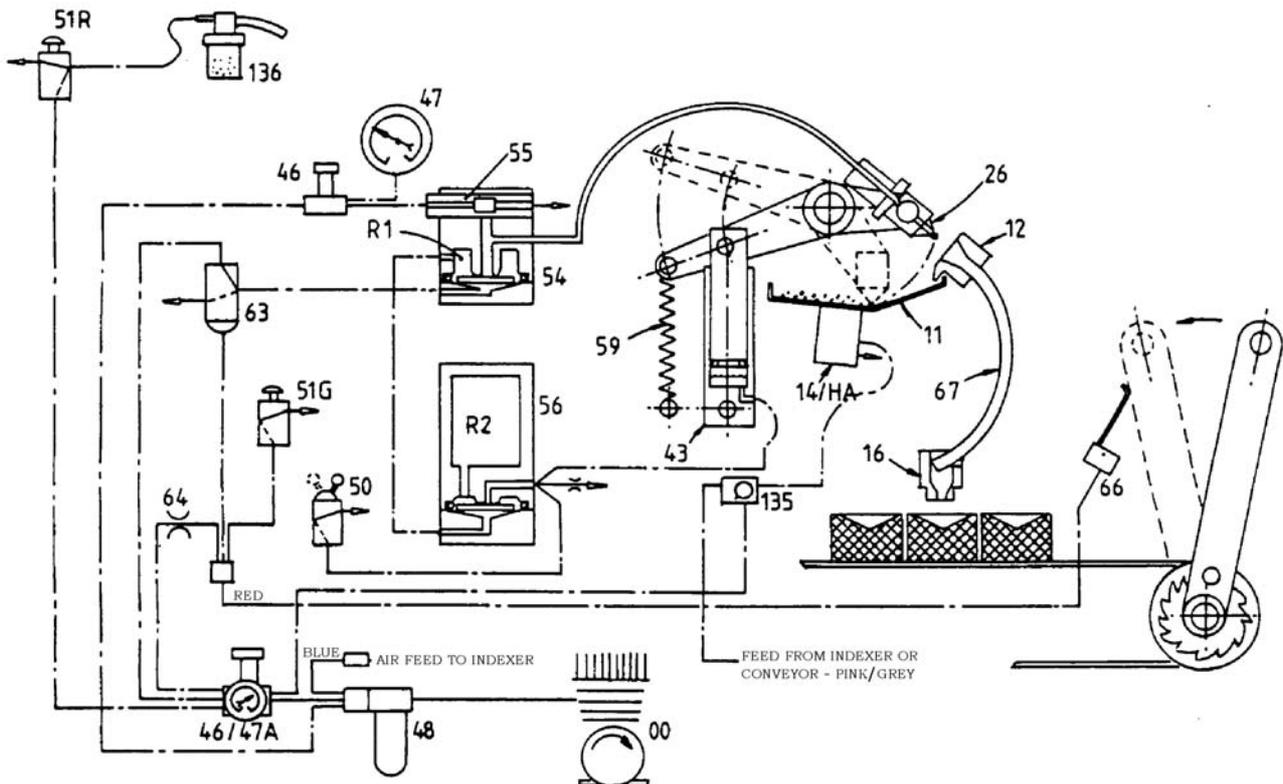
The seeds then travel down nylon tubes (67) to the seed receiver cups (16). The air blast from the small reservoir is rapidly discharged and the venturi (55) quickly creates a vacuum in the pick-up nozzles ready for them to collect the next row of seeds.

The release of the air from the small reservoir (45) allows the disc valve (56) to discharge the contents of the larger reservoir into the air cylinder (43) which outstrokes and moves the pick-up nozzles (36) down into the seeds in the seed tray (11). Simultaneously, this discharged air is exhausted through a restrictor.

The vibrator attached to the underside of the seed tray, agitates the seeds enabling the suction air flow to carry them to the nozzles, at full piston outstroke.

As the reservoir pressure declines, whilst it is passing through the restrictor, the return spring (59) pulls the piston more slowly, back up to the discharge position. (Whilst the nozzle bar is returning to the discharge position, if lettuce or verbena is being seeded, the seeds are drawn in a wiping action over a profile bar (12) which removes the majority of excess seeds.)

Once the pick-up bar has returned to the discharge position, it awaits the next signal.



03.1 Row Setting

The standard 18 row Natural Seeder is set up in our workshop to sow fourteen rows at a time, this is for testing purposes. To change the number of rows: -

- 1) Remove the nylon discharge tubes from the receiver cups and take the cups out of the fourteen row discharge plate.
- 2) Change the discharge plate for the one required.
- 3) If necessary, punch the holes to suit your trays in a blank plate, with the 1/2" hole punch provided.
- 4) Replace the appropriate number of receiver cups in the plate and fit the same number of discharge tubes between the profile bar and the receiver cups.
- 5) Adjust the height of the receiver cups so that they are approx. 8mm over the tray or peat blocks.
- 6) Remove the M5 x 8 Seed Stop Plugs and 'O' rings from the lines of the nozzle bar that are not being used, and replace them with the tapered end seed eliminating screws, engaging the taper in the holes in the back of the brass nozzles.



The seed discharge tubes have both ends machined inside to a taper, to help prevent seed hang-up. If the tubes have to be shortened, ensure the tapered end is fitted into the profile bar.

03.2 Preparation For Seeding

Connect the power supply of the compressor to a suitable power source, place a small quantity of seeds in the seed tray and check the operation of the seeder by pressing the green button on the top of the control cabinet. At this stage the machine should be set for level to ensure the even distribution of seeds in the seed tray. The vibration of the tray during operation causes the seeds to flow to the lowest position in the tray. Switch vibrator to 'Test' position. The machine levelling from side to side is effected by rotating the large knurled knob (Fig.4, No.4) at the end of the machine. The tray is to be set to an angle fore and aft which just allows the seed to gently move towards the pick-up point, which is where the base of the tray is bent.

It is important that only a single layer of seeds is present at the pick-up position. An excess of seeds at this point tends to wipe off seeds at the nozzles, as the nozzle bar leaves the tray. The tilt adjustment depends upon the quantity of seeds in the tray. Generally speaking, larger quantities of seed at the pick-up point requires less tilt, smaller quantities requiring slightly more tilt.

03.3 Discharge Tubes

The seeder is supplied with two sets of discharge tubes. The size of the standard tubes is 3/8" (9.5mm) outside diameter, and the size of the large tubes is 1/2" (12.7mm) outside diameter.

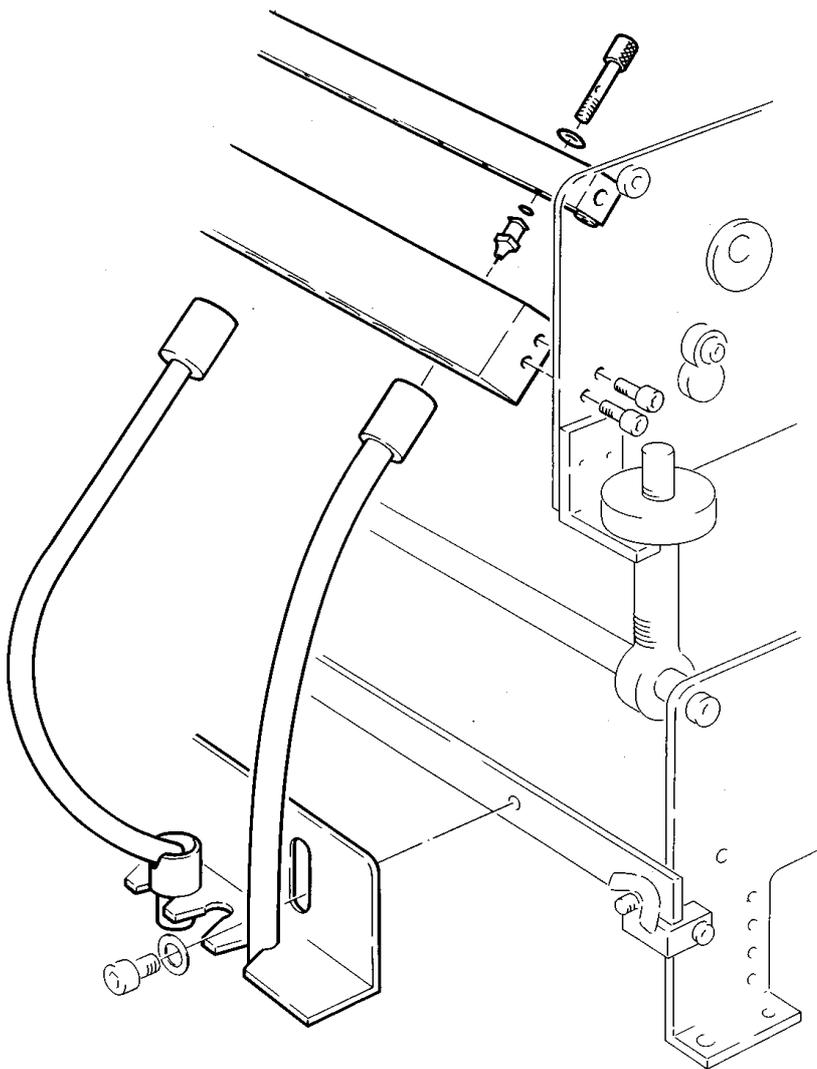
The standard tubes are used for most seed varieties, and the large tubes are used for much larger seed such as clipped marigold, dahlia, etc.

The standard tubes are fitted with a black aluminium adapter which fits into the profile bar at the top end. Always make sure that the tube is pushed fully into the adapter, otherwise a gap is left which can catch seed as it is falling into the tube.

The bottom end of the tubes fit into the receiver cups which are placed in the discharge plate, which is spaced according to the tray pattern.

The large tubes fit directly into the profile bar at the top, without adapters. At the bottom end, they go straight through the discharge plate holes and must be trimmed to length about 1/8" (3mm) above the surface of the tray. When the large tubes are fitted, the stainless steel profile strip must be removed from the back of the profile bar.

The standard discharge plate can be modified as shown below, so that the large tubes can be snapped into position, to avoid buckling. The same plate can then be used when reverting to standard tubes and receiver cups. See also 09.9.8.



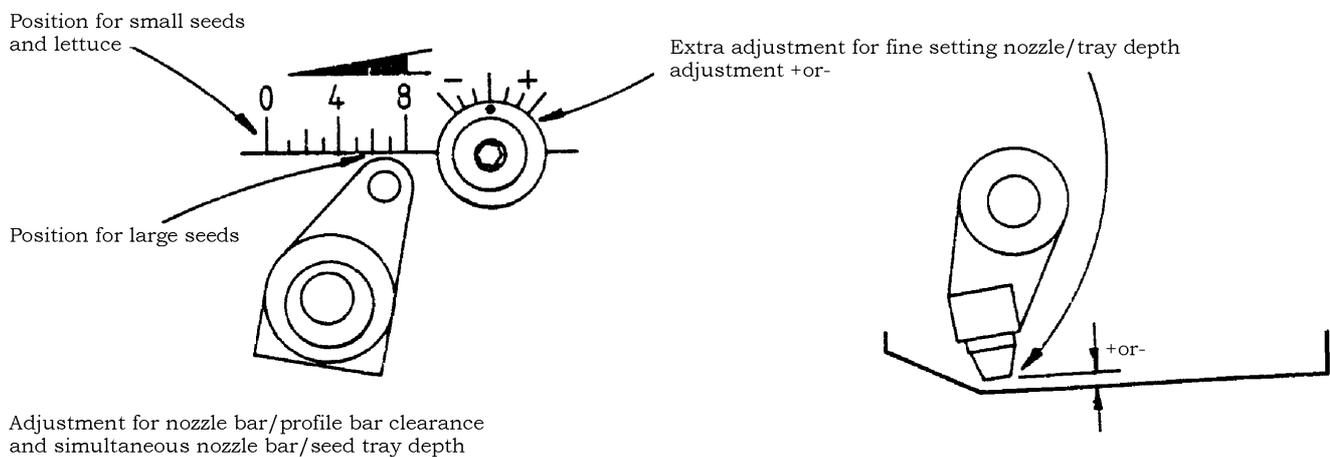
04.0 CONTROLS & ADJUSTMENTS

04.1 Procedure For Setting Seeder

- 1) Put desired amount of seed into tray - do not overfill (see 03.2)
- 2) Level tray and set tilt (see 03.2)
- 3) Set nozzle clearance (see 04.1)
- 4) Set Vacuum (see 04.5)
- 5) Set Vibration (see 04.3)
- 6) Try a dry run (see 04.6)

04.2 Setting Nozzle Clearance.

The coupled eccentrics which form the bearings of the main shaft of the seeder allow the clearance between the seed pick-up nozzles and the profile bar to be adjusted at the same time as the clearance between the nozzles and the seed tray. This adjustment is made by rotating the eccentrics on the main shaft, using the secondary shaft and the connecting linkages. A wing nut clamp for locking the secondary shaft is positioned on the outside of the machine's end plate. Calibration of this adjustment is made on the machine main plate. Fine clearance between the nozzles and the seed tray can also be made by the cylinder stop adjustment (+or-). Usually, the larger the seed, the larger the clearances. See also section 04.6.



04.3 Vibration Control

A control valve is fitted for the control of the vibrator unit, which vibrates and agitates the seed all the time the machine is seeding.

As can be seen on the valve, there are two positions for the valve spool, push the valve down for normal operation and up for testing. With the valve in the 'normal' position the vibrator will operate only when the machine is seeding, and will be controlled by either the pusher mechanism or by the conveyor controls. In the 'test' position the vibrator will run all the time, to enable the operator to set up the machine at the beginning of a seeding run. When the machine is sowing normally make sure that the valve is switched back to the 'normal' position, to maximise the life of the vibrator.

The valve is calibrated as can be seen, and the vibration can be adjusted by the control knob. Turning the knob to a higher number increases the level of vibration. For small seeds a low number should be used, for large seeds a higher number. The table following this section will give a rough guide to the settings, but variations will have to be made to suit your own seed and conditions.

04.5 Pressure/Vacuum Adjustment

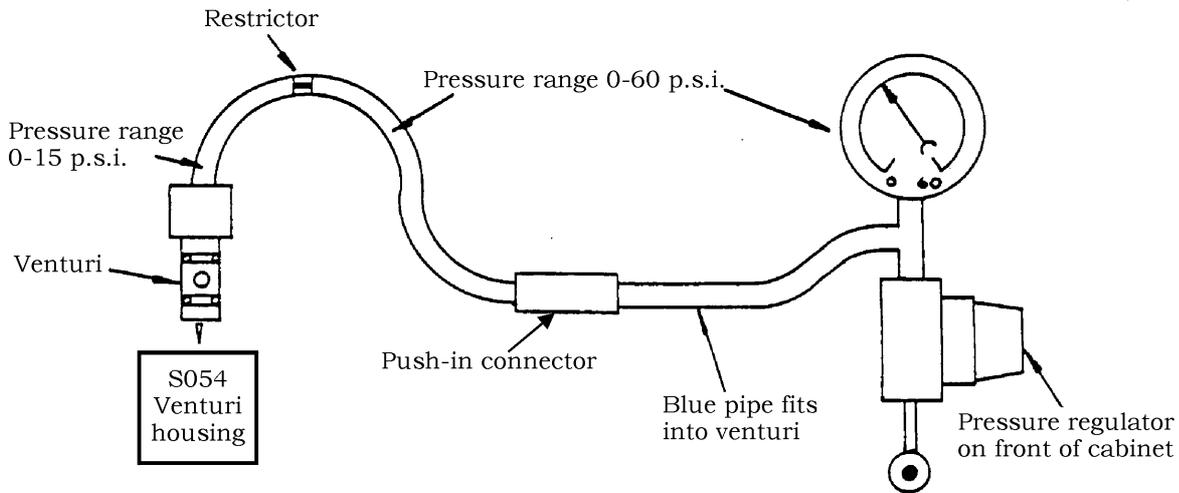
The vacuum necessary to lift the seeds from the tray is produced by passing compressed air through a simple venturi (Section 07.1, Ref.55). Increased air pressure produces a greater suction. The venturi can be easily inspected at any time, by lifting it out of its housing with the blue pipe, which is close to the cabinet hinge, on the inside of the cabinet. The venturi air pressure is controlled by the pressure regulator which is mounted on the front of the control cabinet. The pressure is set according to the size and weight of the seed used. To adjust the regulator, pull the red locking ring outwards and rotate the black knob, setting the pressure required on the adjacent gauge.

The following table is a rough guide for initial setting. Finer adjustments must be made by the operator to suit his particular seed. Excessive vacuum on certain seeds will produce multiples. Not enough vacuum will cause misses. Be sure that the tray is correctly adjusted for level and tilt and that the nozzle clearance is correct. Due to a certain amount of dust and dirt being present in the seed, it is important that the venturi is removed periodically and cleaned. The nozzle cleaning wires provided are useful for this purpose. (See 06.5)

04.6 "Dry Run"

Carry out the procedures outlined in section 04.1. Once the vacuum is adjusted to a rough setting, inspect seed pick-up visually on the nozzle bar. The seed can be released back into the tray, simply by pushing the nozzle bar down about 12mm (1/2") towards the seed tray, and depressing the green button. The machine will repeat the cycle for inspection. Once you are satisfied with the visual check, use a blank empty tray (white if possible) to try a dry run. Inspect the tray for doubles or misses, and adjust the pressure accordingly. If a change in pressure does not produce the necessary results, then it is likely that the nozzle clearance is not correctly set. Reset the clearance and re-check. Make sure the nozzles are very nearly touching the seed when it dips into the tray. The tray vibrator will cause the seed to dance and pick up on the nozzles. Setting the adjustments too close may push the seed out of the way, rather than picking it up.

04.7 Low Vacuum Adjustment



It has been found that very small seeds such as celery and petunia can only be picked up singly with high accuracy if the air pressure supplying the venturi is held very steady at pressures less than 5 p.s.i.

To provide the stable adjustable low pressure, a Low Vacuum Regulation Adapter has been devised which, when fitted between the Pressure regulator and the venturi, converts the 0-60 p.s.i. full range output from the regulator to a 0-5 p.s.i. range at the Venturi. The adapter effectively reduces the air pressure by approx. 4:1. i.e., 20 p.s.i. on the pressure gauge is actually 5 p.s.i. at the venturi.

To fit the Low Vacuum Regulation Adapter - Pull the small blue nylon pipe out of the venturi and insert it into the tubular push-in connector, and finally insert the tube end of the adapter into the venturi.

05.1 Isolation Control

The switch operated valve (Section 07.1, Ref.50) on top of the control cabinet will switch off the seeder head, to enable the indexing mechanism to be run without the seeder operating.

05.2 Manual Control Button

The green button positioned on the top of the control cabinet initiates a single seeder cycle to operate the machine without an indexing mechanism.

05.4 Vacuum Cleaner

The push-in connection at the back of the control cabinet just below the red push button is the air supply point for the vacuum cleaner. To operate insert the small bore nylon pipe and press the red button. Pass the collector pipe over the surface of the seed tray to clear out the unused seeds. The seeds collected by the vacuum cleaner should be cleaned before re-use to remove small pieces off seed husk and dirt. Remember that small pieces of dirt will be picked up by the seed nozzles and will be sown as if they were good seeds.

05.5 Nozzle Cleaning

A tube for cleaning the nozzle bar with a blast of air is provided. This clear tube with a black end adapter is inserted into the same outlet as for the vacuum cleaner, with the black end adapter into the nozzle bar push-in connector. A few short blasts of air controlled by the red push button should eject all but the most stubborn dirt. Should a blockage persist, then remove the M5 x 8 seed stop plug and 'O' ring from the appropriate nozzle, and feed the cleaning wire provided in the back of the nozzle and through the nozzle hole. Replace the plug screw and give a couple of blasts of air with the adapter tube.

When using the 0.14 mm nozzles, the complete nozzle bar must be removed for cleaning. Use the special 0.14 mm cleaning wire and insert through the nozzle tip. The Self Clearing nozzle bar should only be cleaned as described in section 09.6.

05.6 Push-in Connections

Pipes should only be inserted and removed when there is no compressed air present at the joint.

To make a connection, insert the nylon tubing in the hole until it meets the resistance of the sealing ring. At this point continue pushing, but harder, to overcome the seal resistance and until the pipe moves up to the positive end stop. To remove the pipe, push the connector bezel in (using a firm edge) and, whilst still holding the bezel in, pull firmly on the pipe.

05.7 Air Shut-Off

The air shut off valve is next to the air filter on the side plate of the machine. Twist to turn the air off to the seeder head. Use this to turn off the air to the system when carrying out maintenance work and adjustments.

06.0 Sowing Larger Seeds

Seeds as large as Cyclamen and Freesia can be sown by the Hamilton Natural Seeder if the following steps are taken: -

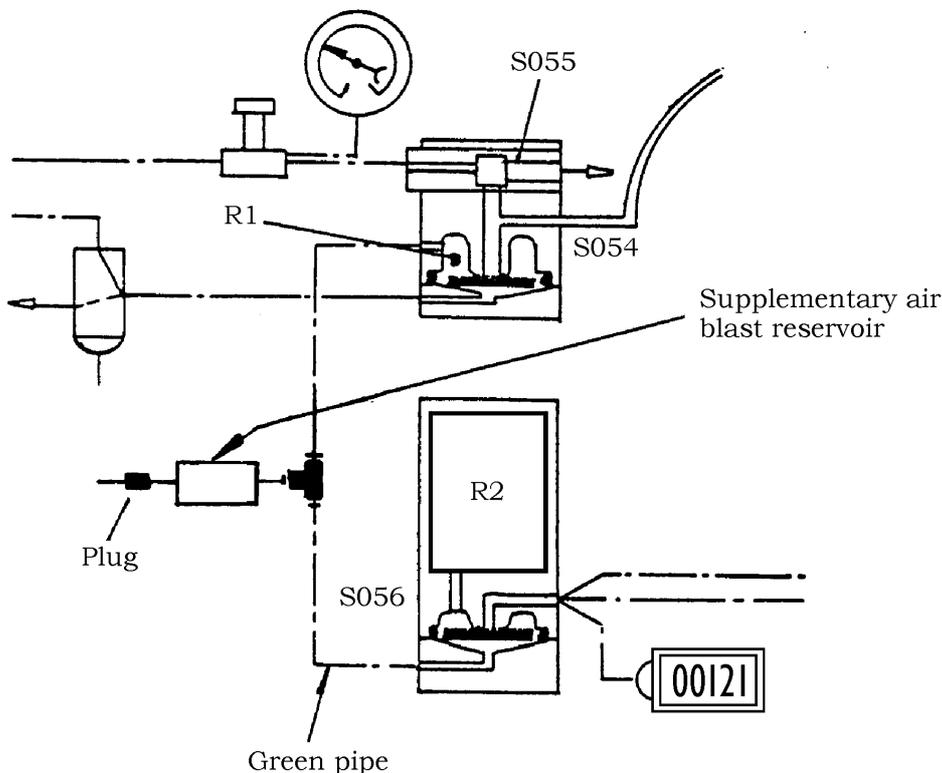
- a) Fit Nozzle Bar, which has the 0.6mm holes.
- b) Fit Large Venturi S055L.
- c) Insert Packing Washers under the Nozzle Manifold. (Standard M5 washers)
- d) Fit Supplementary Air Blast Reservoir if required. S132 (see below)
- e) Fit the largest Seed Receiver Cups S016/7. (7mm hole)

When the Large Venturi is operating in the higher pressure range its evacuation rate is so great that it can extract the air from the small reservoir R1 in Valve S054 so rapidly that a positive pressure may not be reached to discharge the seeds, hence the possible need for the Supplementary Air Blast Reservoir. S132

The Supplementary Reservoir should be inserted in the green pipe connection between the Venturi Housing S054 and the Distributor Valve S056. When required, the Supplementary Reservoir can be easily taken out of action by reversing the reservoir in the tee-piece.

The packing washers referred to in (c) are merely standard 5mm steel washers which are used as distance pieces to raise the pick-up nozzles higher above the seed tray, just above the seeds. The thickness of this packing is approx. 1.5mm.

For large, odd shaped, seeds such as cucumber, it is beneficial to use the Universal Profile Bar which has much larger discharge tubes to avoid seed block-up (see 09.4). For even heavier seed, use the Double Venturi Kit (see 09.5).



06.1 Long Seeding Runs

If one type of seed is being used for a long period of time, it is occasionally necessary to empty the seeds from the machine and thoroughly clean the tray. Remove all the dirt and dust from the seeds before replacing them in the machine. If this is not carried out, the rubbish will accumulate and will be picked up by the nozzles in place of good seed.

06.2 Sowing Peppers And Begonias

Because of the irregular shape of pepper seed, occasionally the seed may spin off the nozzle bar when the air blast occurs, missing the discharge tubes. When sowing begonias, it has also been found that if the 0.14mm nozzle bar is used, the time taken for the air blast to escape from the small hole is too long.

The cure for both of these problems is to fit a packing disc (S133) into R1 in valve S054 (see diagram in 06.0). This effectively reduces the volume of the air blast reservoir, giving a shorter and less violent blast.

To fit the disk, remove the cover of S054 and insert it behind the rubber pad.

Replace the cover, ensuring that the rubber pad is not trapped, and that the sealing 'O' ring is correctly in position.

06.3 Nozzle Selection

The following is the range of nozzle bars available for the Hamilton Natural Seeder.

Part No.	Description
S26N3	Single hole 0.3mm standard nozzle bar
S26N6	Single hole 0.6mm standard nozzle bar
S26N14	Single hole 0.14mm standard nozzle bar
S26ND	Double hole 0.3mm nozzle bar
S26NT	Triple hole 0.3mm nozzle bar
S26ND14	Double hole 0.14mm nozzle bar
S26N25SCA	0.25mm Self-Clearing nozzle bar (Needle tip)
S26N3SCA	0.3mm Self-Clearing nozzle bar
S26N6SCA	0.6mm Self-Clearing nozzle bar
S26N115	Single hole 1.15mm standard nozzle bar
BK002	Begonia nozzle bar kit
LK002	Lobelia nozzle bar kit
S26NN	Needle Nozzle Bar Kit (0.1mm, 0.25mm & 0.5mm needles)
S26NPILL	Rubber Tipped nozzle bar

06.3 Nozzle Selection Continued

S26N3 The standard 0.3mm bar can be used on a wide variety of seed from Petunias to Cabbage. When sowing minute seed (Petunia etc.) you should use the blue restrictor supplied with the seeder (see 04.7). The restrictor can also be used with larger seeds (Impatiens etc.), but bear in mind that the maximum pressure is limited to about 5 p.s.i.

S26N6 Also available is a 0.6mm nozzle bar, which generally works better on larger seeds such as Peppers, large Cabbage, Cyclamen etc.

S26N14 Another bar in the range is the 0.14mm bar. This is used for exceptionally small seeds. It is also recommended that seed tray dividers (Part No.S161A) are used for small quantities of seed.

S26ND S26NT S26ND14 The double and triple hole bars are available with two or three holes in each nozzle for sowing multiple or poor germination seeds in one operation.

S26N25SCA S26N3SCA S26N6SCA The Self Clearing nozzle bars ensure that the nozzles are automatically cleaned on every operation of the seeder. This means that the nozzles require virtually no visual checking during a seeding run. See 09.6.

S26N115 The 1.15mm bar is for extremely heavy seed and is supplied with the double venturi kit. (See Section 09.5)

BK002 LK002 The Begonia and Lobelia Kits are for precise multiple sowing of raw Begonia and Lobelia seeds. (See 09.7 and 09.8)

S26NN The Needle Nozzle Bar kit can single sow a range of seed from raw begonia up to salvia with just one nozzle bar.

S26NPILL The Rubber Tipped Nozzle Bar is specifically for larger pelleted seeds such as tomato and lettuce.

06.4 Troubleshooting

Problem:

Seeder will not pick up or pick-up is erratic.

Solution:

- a) Check that there is sufficient air pressure to raise the cylinder against the eccentric stop consistently. If pressure is not adequate, the nozzle bar will not reach the set position to pick up the seed. Increase the pressure (on the regulator inside the cabinet) until the piston comes into contact with the 'O' ring buffer stop in the outstroke position.
- b) Check for dirty nozzles. The Hamilton Seeder is largely self cleaning because of the air blast supplied to the nozzles to discharge the seed. Check the nozzle clearance. If a nozzle is consistently missing on pick-up, remove the appropriate cap screw and run the cleaning wire provided, through the blocked nozzle.
- c) Check that the venturi is free from any dirt build-up that may occur over a long period of time.
- d) Vacuum may be too low, or the nozzles could be too high above the seed.
- e) Make sure that the seed is not being wiped off the nozzle as it passes the profile bar. Adjust the main shaft eccentric if necessary.

Problem:

Machine will not sow last row of seed. (Tray Indexer)

Solution:

Set up was not correctly carried out. Refer to the installation instructions for the indexing unit in Section 09.2.1.

Problem:

Seed tray overshooting hole. (Tray Indexer)

Solution:

Forward speed of indexing unit is set too fast. Slow down by turning the bottom knob on the control panel to a higher setting.

Problem:

Cracked seed hulls appearing in tray.

Solution:

Nozzles are set to dip too low into the tray. Refer to Clearance Section (04.2) and "Dry Run" (04.6).

Problem:

Seeder will not start operation. (Tray Indexer)

Solution:

- a) Make sure there is an adequate air supply pressure (approx. 80 p.s.i.).
- b) Poppet valve requires lubrication - consult dealer or manufacturer.
- c) Check that there are no leaking connections, in particular the red tube connecting the air control panel to the indexer control box.

Problem:

Visual seed inspection good, but operating poorly.

Solution:

- a) Inadequate pressure - pressure drop is occurring as indexing unit operates and causing a lack of pressure to the seeder cylinder. Increase pressure on the regulator inside the cabinet and check compressor air supply is adequate.
- b) Vibration unit is not operating properly, contact dealer or manufacturer for replacement.

Problem:

Seeder will not shut off (Tray Indexer).

Solution:

Check that there is an adequate flow of air from the sliding air limit switches. If there is no air flow, the yellow or grey restrictor loop pipes may be blocked on the air control box. The cause for the blockage could be excessive dirt or moisture in the atmosphere. An additional air cleaner or dryer should be considered.

06.5 General Maintenance

With a small amount of care and maintenance, your Hamilton Seeder will operate trouble free for years to come.

Every 50 hours of use, put a drop of oil on the main shaft bearings (in the small hole in the brass eccentrics), and on the top pivot of the piston. Lift the piston out of the cylinder by manually depressing the nozzle bar, and wipe a small amount of oil around the piston itself. Never oil the machine while it is operating, and take care not to use too liberally. Wipe off any excess.

Also at 50 hour intervals, the venturi should be cleaned. Simply remove it from the housing and use one of the nozzle cleaning wires provided to free any build-up of dust or seed coating material.

In extremely humid conditions (80% RH and above) it may be necessary to install an additional air dryer in the main airline to the seeder. It is also recommended that the air tank of the compressor is drained daily.

06.6 Storage

When your seeder is not in use, keep it covered with a plastic sheet, or similar, to keep it clear of dust and dirt.

At the end of the season, or when storing the Seeder for prolonged periods, keep it in a dry place free from dust and dirt. Clean out the seed tray before storage, and protect the main air supply line by covering with a piece of pipe.

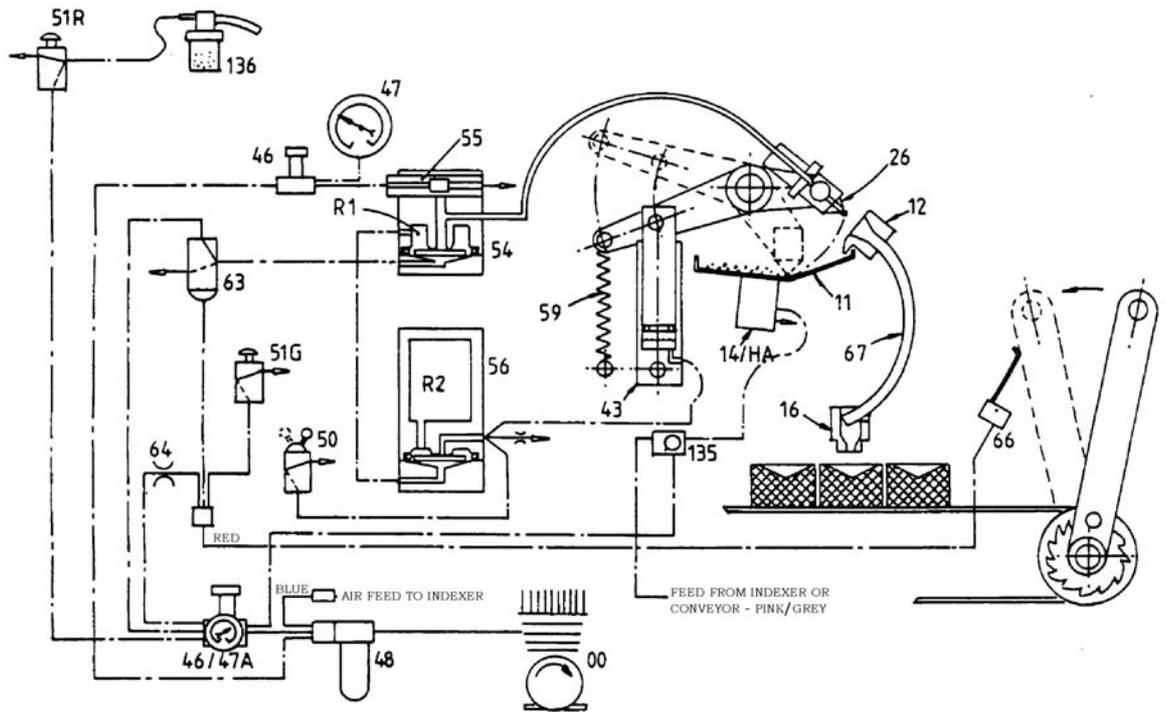
The HAMILTON NATURAL SEEDER

07.0 CIRCUIT DIAGRAMS

The following pages make up the circuit diagrams for the various components of the Hamilton Natural Seeder:

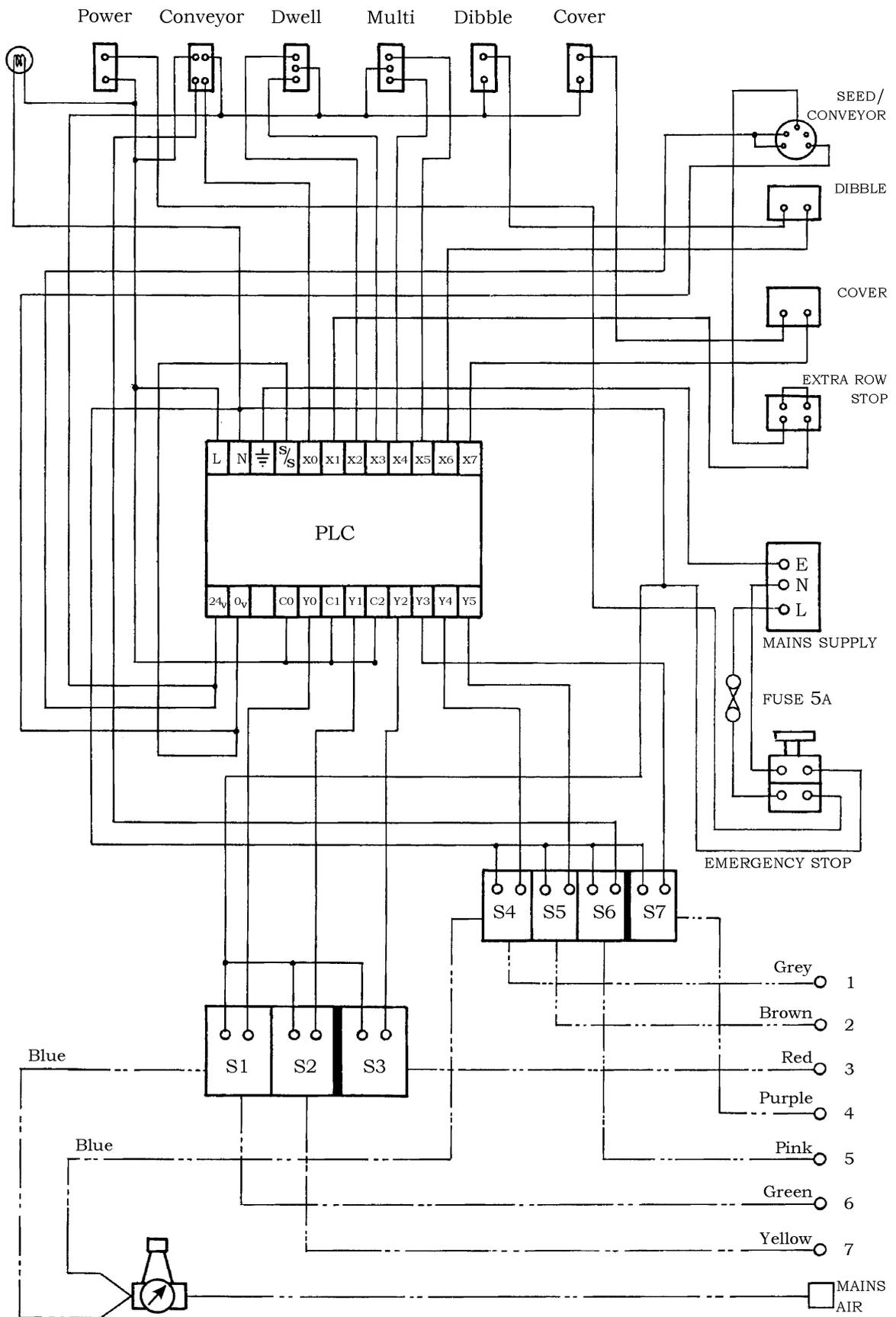
Air circuit for the Hamilton Natural Seeder	07.1
Air circuit for the PLC Indexer	07.2.0
Wiring Diagram for PLC Indexer	07.2.5
PLC Conveyor Control circuit	07.3
PLC Conveyor Connections	07.4

07.1 Air Circuit – Natural Seeder

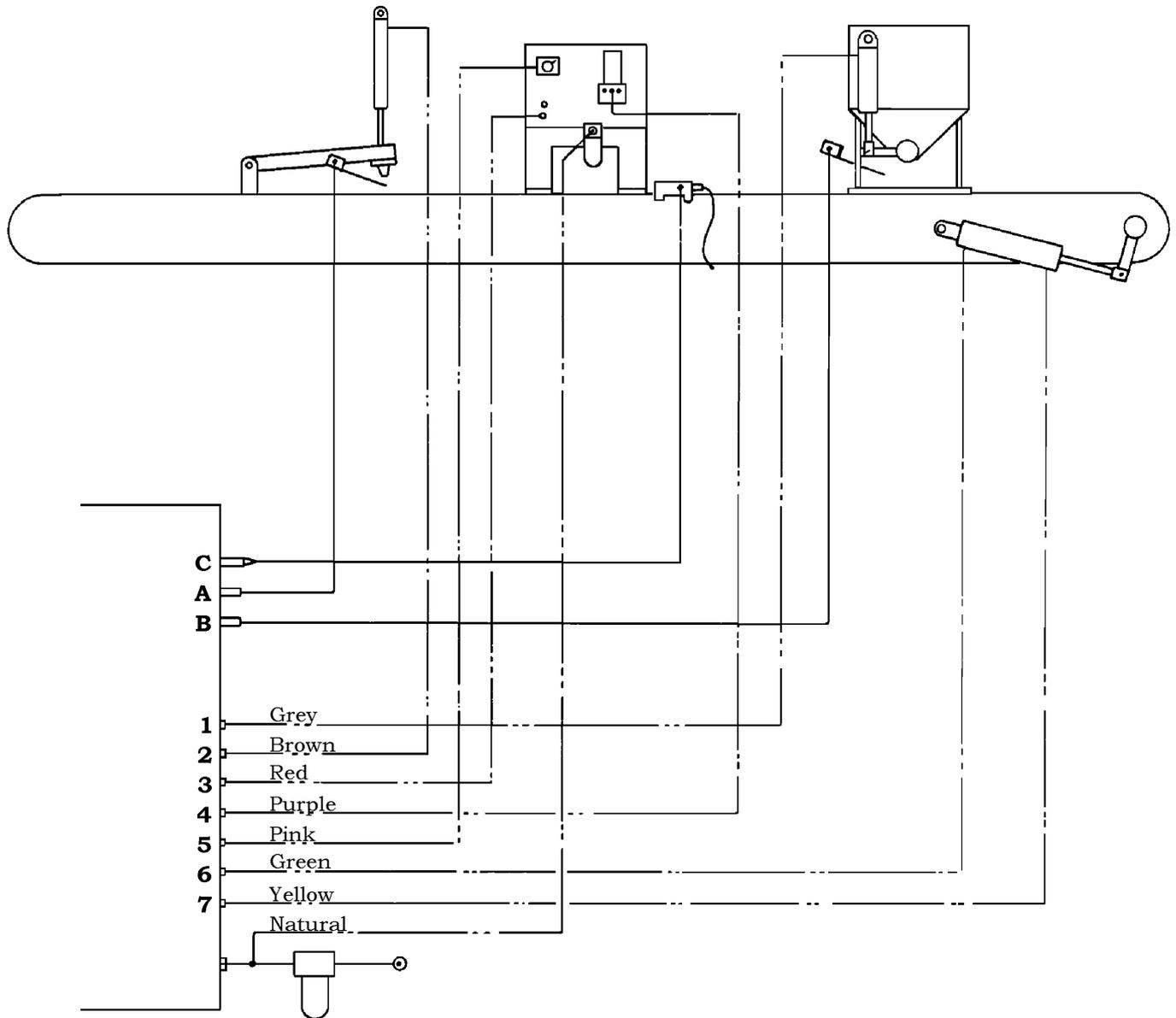


Ref.	Part No.	Description
11	S011D	Seed Tray
12	S012B	Profile Bar
14/HA	S014HA	Vibrator
16	S016S5	Seed Receiver Cups
26	S26N**	Nozzle Bar Assembly
40	S040	Main Shaft Eccentrics
43	S043	Air Cylinder Barrel
46	S046	Pressure Regulator
47	S047A	Pressure Gauge
48	S048	Air Line Filter (automatic)
50	S050	Switch Operated Valve
51G	S051G	Push Button Valve (Green)
51R	S051R	Vacuum Cleaner Push Button Valve (Red)
54	S054SA	Venturi Housing/Air Blast Valve
55	S055S	Venturi
56	S056SA	Distributor Valve Assembly
59	S059	Return Spring
63	S063	Air Operated 3-Port Valve
64	S064	Pipe with Restrictor (Yellow)
66	S066SA	Trip Valve Assembly
67	S067	Seed Discharge Tubes
135	S135SA	Vibrator Control Valve Assembly
136	S136	Vacuum Cleaner
00	COMP01	Air Compressor

07.3 PLC Conveyor Control Circuit Diagram



07.4 Connections Diagram - PLC Conveyor



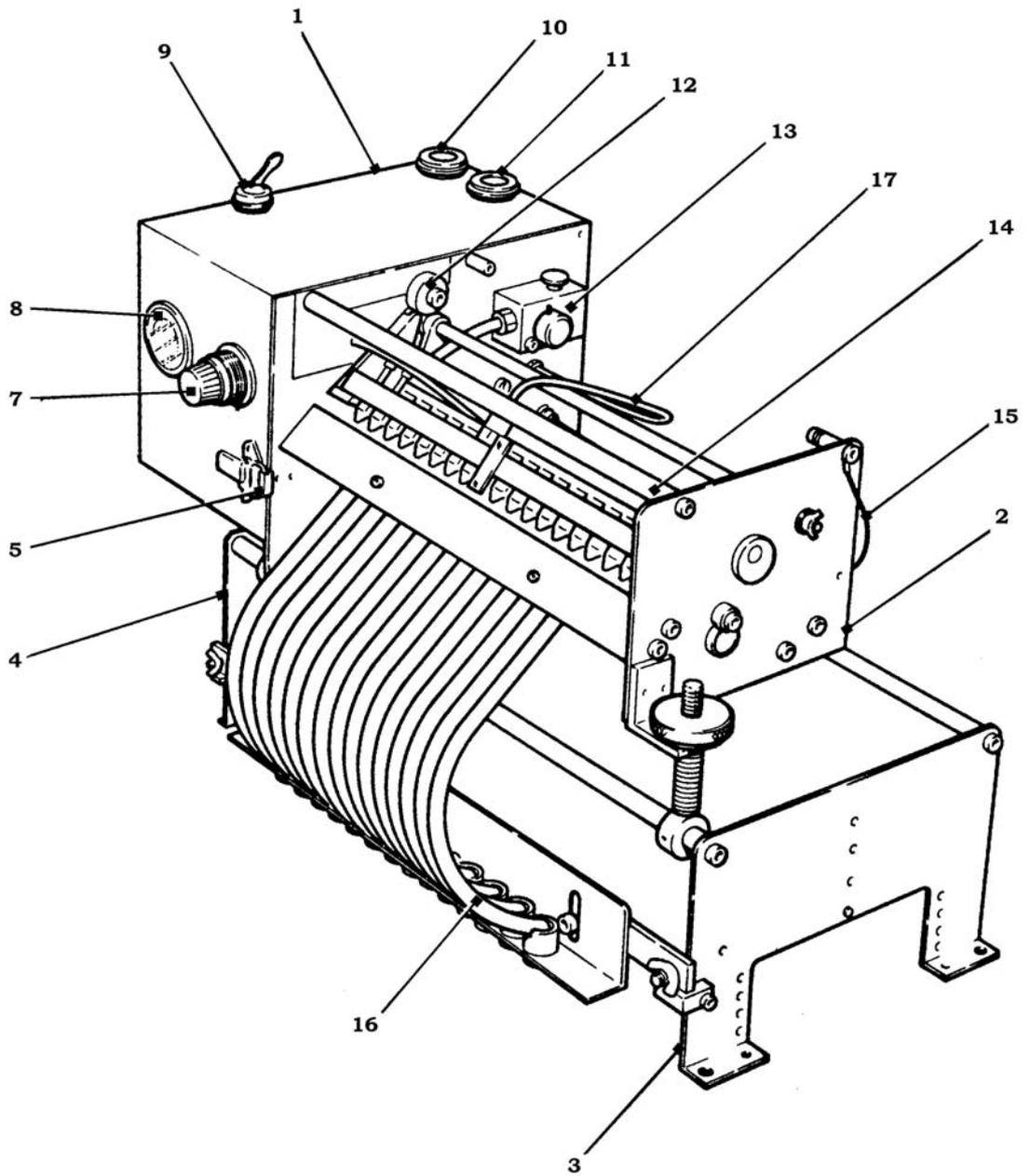
The HAMILTON NATURAL SEEDER

08.0 EXPLODED VIEWS AND PARTS LISTS

The following pages make up the exploded views and parts lists for the various assemblies of the Hamilton Natural Seeder:

Figure 1	Hamilton Natural Seeder
Figure 2	Control Cabinet
Figure 3	Linkage/Mechanism
Figure 4	Stand Assembly
Figure 5	Tray Vibration Unit
Figure 6	Self-Clearing Nozzle Bar

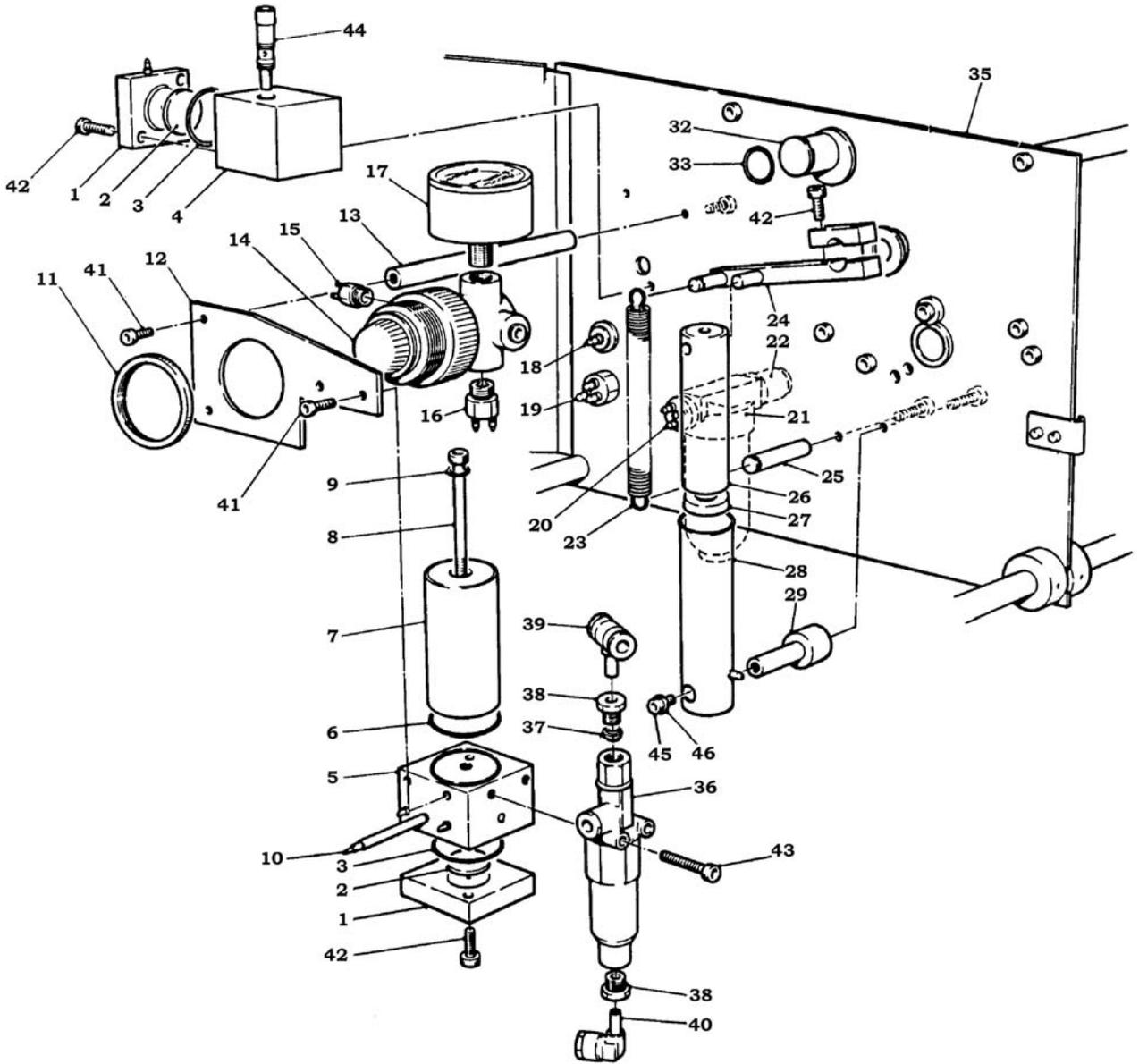
FIGURE 1
Hamilton Natural Seeder



Key To Figure 1

Illustration per Number	Part No.	Description	Qty
	machine		
1	S003	Valve Cover	1
2	S002	End Plate	1
3	S015RH	Stand Plate (Right Hand)	1
4	S015LH	Stand Plate (Left Hand)	1
5	S094	Toggle Latch	1
7	S046	Pressure Regulator, fitted with:	2
	S084	1/8" BSP Male Barb - Single	1
	S085	1/8" BSP Male Barb - Double	2
8	S047	Pressure Gauge 0-60PSI (50mm)	1
9	S050	Switch Operated Valve, fitted with:	1
	S089	3/16" Enots Plug Tee Barb.	1
10	S051R	Push button valve (Red)	1
11	S051G	Push button valve (Green)	1
12	S020	Piston Stop Adjustment Knob	1
13	S135SA	Vibrator control valve Assembly	1
14	S037	Main Plate Tie Rod	2
15	S143	Cleaning Wire Attachment Cable	1
16	S067	Discharge Tube (Prepared Ends)	18
17	S076	Vacuum Pipe-6mm O/D, fitted with:	1
	S054-3N	Tubing Nut 6mm	1
	S054-3S	Tubing Sleeve 6mm	1

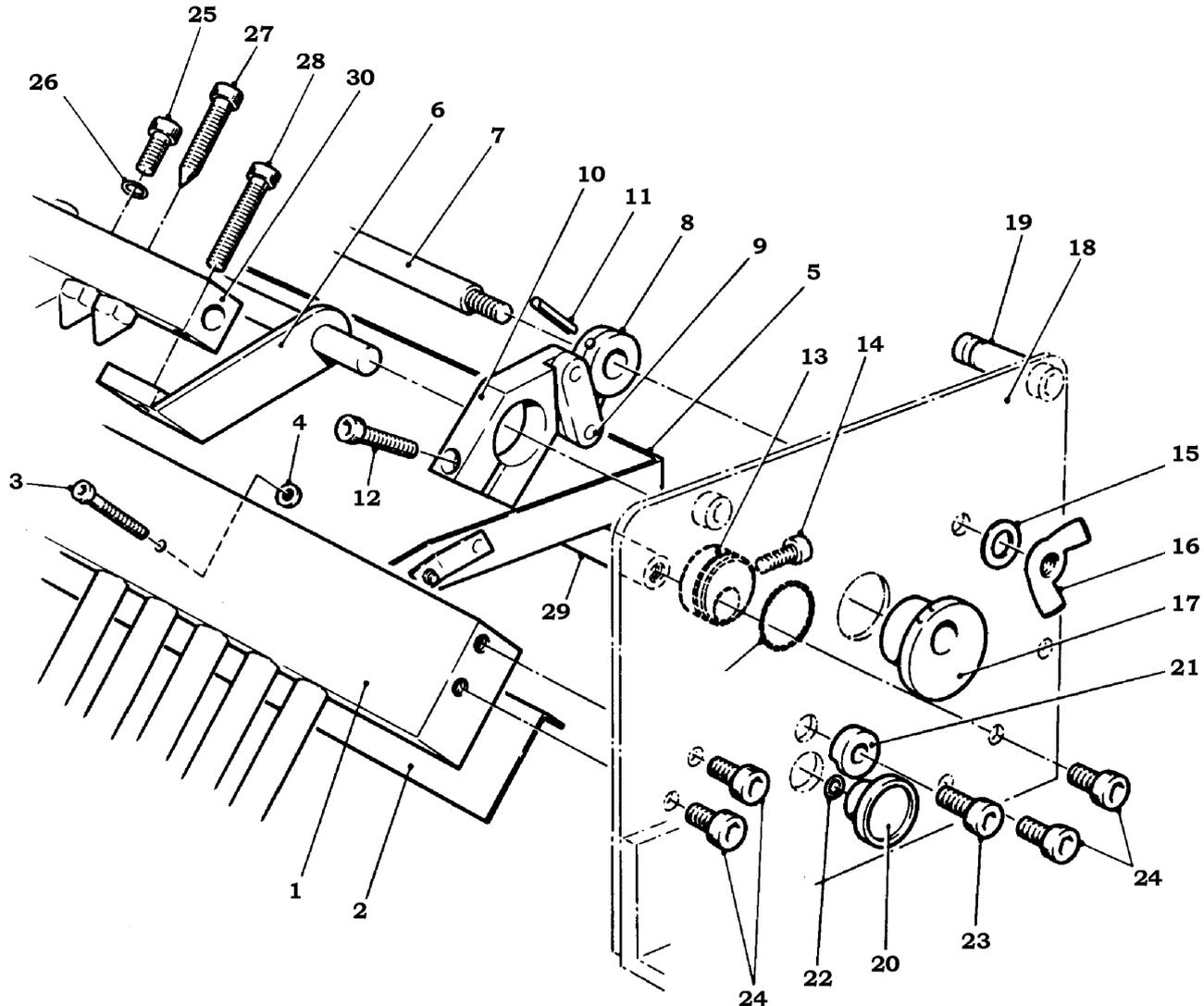
FIGURE 2
Control Cabinet



Key To Figure 2

Illustration Number	Part No.	Description	Qty per machine
1	S054-2	Valve Cover	2
2	S057	Valve Disc Rubber	3
3	S058A	Valve Cover 'O'Ring	2
4	S054-1	Venturi/Air Blast Housing	1
5	S056-1	Distributor Valve Body	1
6	S056-3	Reservoir/Housing Seal	1
7	S056-2	Air Reservoir	1
8	S111	M5 x 65 Socket Head Cap Screw	1
9	S260	Screw Seal	19
10	S135R	0.55mm Restrictor Barb	1
11	S108	Pressure Regulator Nut	2
12	S004	Valve Mounting Plate	1
13	S061	Support Pillar for Valve Plate	2
14	S046	Pressure Regulator	2
15	S086	1/8" BSP Male Barb - Treble	1
16	S085	1/8" BSP Male Barb - Double	2
17	S047A	Pressure Gauge (0-60psi) - 40mm	1
18	S091A	1/8" BSP x 3/16" Male PIC Barb	2
19	S087	1/8" BSP Female Barb - Treble	1
20	S088	1/4" BSP Male Barb - Treble	1
21	S048	Air Filter Auto	1
22	S093	1/4" BSP x 8mm Male PIC	1
23	S059	Return Spring (Air Cylinder)	1
24	S018	Main Shaft Crank Assy	1
25	S062	Pillar for return spring	1
26	S044	Piston Rod	1
27	S045	Piston Rod 'U' Packing (Mod)	1
28	S043	Air Cylinder Barrel	1
29	S060E	Cylinder Trunnion (Eccentric)	1
32	S019	Piston Stop Eccentric	1
33	S021	Piston Stop Buffer	1
35	S001	Main Plate	1
36	S063	Air Operated 3 Port Valve	1
37	S072	Tubing Sleeve - 3/16"	8
38	S071	Tubing Nut - 3/16"	8
39	S090T	3/16" Enots Stem Tee	1
40	S090E	3/16" Enots Stem Elbow	1
41	S100	M5 x 10 Socket Head Cap Screw	13
42	S099	M5 x 16 Socket Head Cap Screw	6
43	S101	M5 x 25 Socket Head Cap Screw	5
44	S055S	Venturi-Standard c/w Seals	1
45	S26P	M5 x 8 Socket Head Cap Screw	11
46	S107	M5 Plain Washer	4

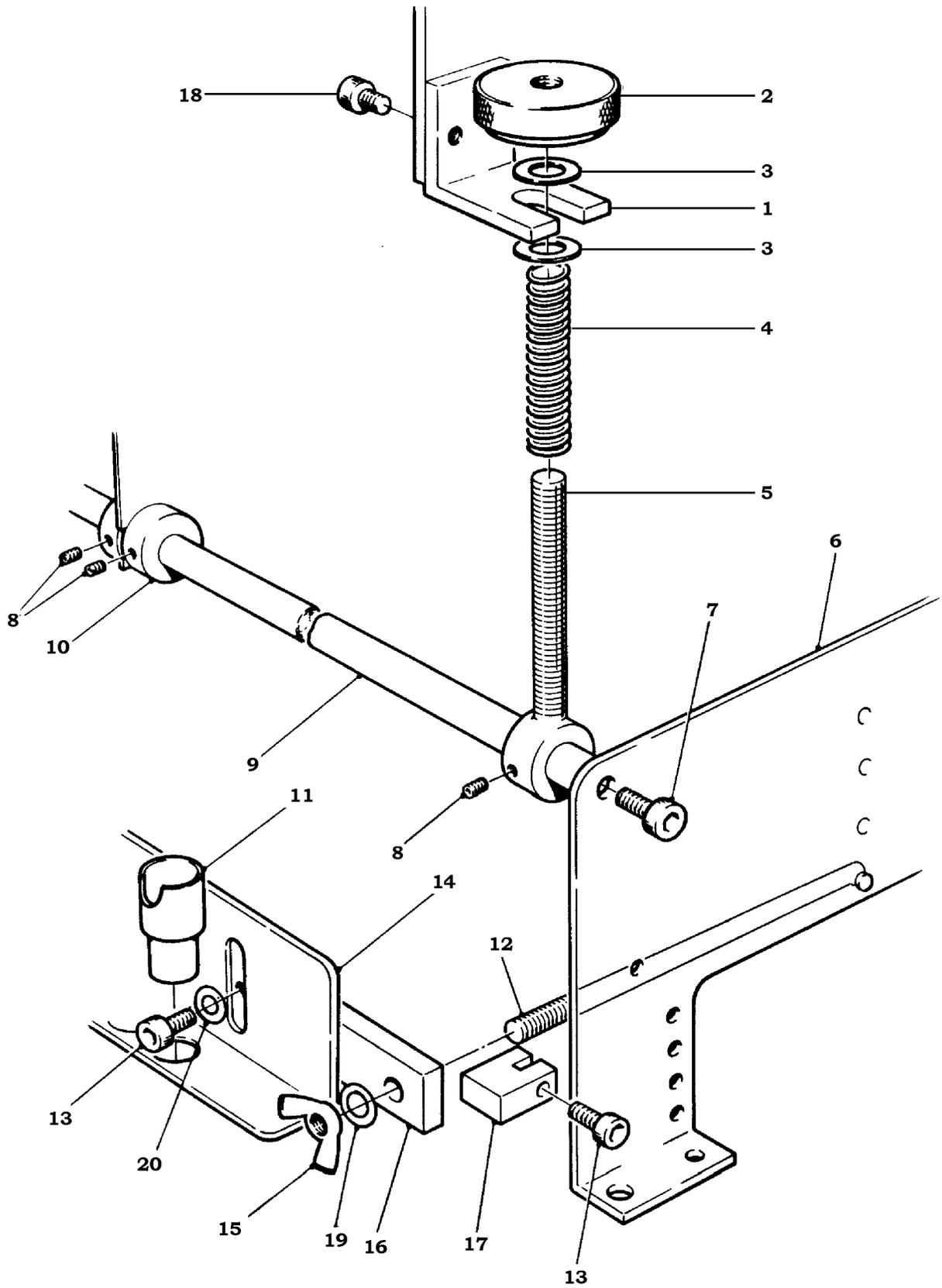
FIGURE 3
Linkage/Mechanism



Key To Figure 3

Illustration Number	Part No.	Description	Qty per machine
1	S012B	Profile Bar	1
2	S138	Profile Strip	1
3	S140	M3 x 20 Socket Head Cap Screw	2
4	S139	Profile Strip Locating Bush	2
5	S011B	Seed Tray	1
6	S013L	Main Shaft	1
7	S038-2L	Primary Shaft	1
8	S038-1	Primary Shaft Crank	2
9	S039	Main/Primary Shaft Link	2
10	S042RH & LH	Eccentric Clamp (Right hand Shown)	1ea
11	S106	Roll Pin - 1/8" x 3/4"	2
12	S118	M4 x 16 Socket Head Cap Screw	2
13	S035	Seed Tray Tilt Eccentric	1
14	S099	M5 x 16 Socket Head Cap Screw	6
15	S104	M6 Plain Washer	3
16	S103	M6 Wingnut	3
17	S040	Main Shaft Eccentric	2
18	S002	End Plate	1
19	S025	Seed Tray Cover Pegs	3
20	S022E	Seed Tray Vibration Mount Housing	2
21	S023	Vibration Mount Clamp	2
22	S022B	"O" Ring - Vibration Mount	2
23	S096	M5 x 12 Socket Head Cap Screw	16
24	S100	M5 x 10 Socket Head Cap Screw	13
25	S26P	M5 x 8 Socket Head Cap Screw	11
26	S26O	Screw Seal	19
27	S065	Seed Eliminating Screw	8
28	S101	M5 x 25 Socket Head Cap Screw	5
29	S034	Seed Tray Support Rod	1
30	S26L	Seed Nozzle Manifold (18 row)	1
31	S035A	Tilt Eccentric 'O' Ring	1

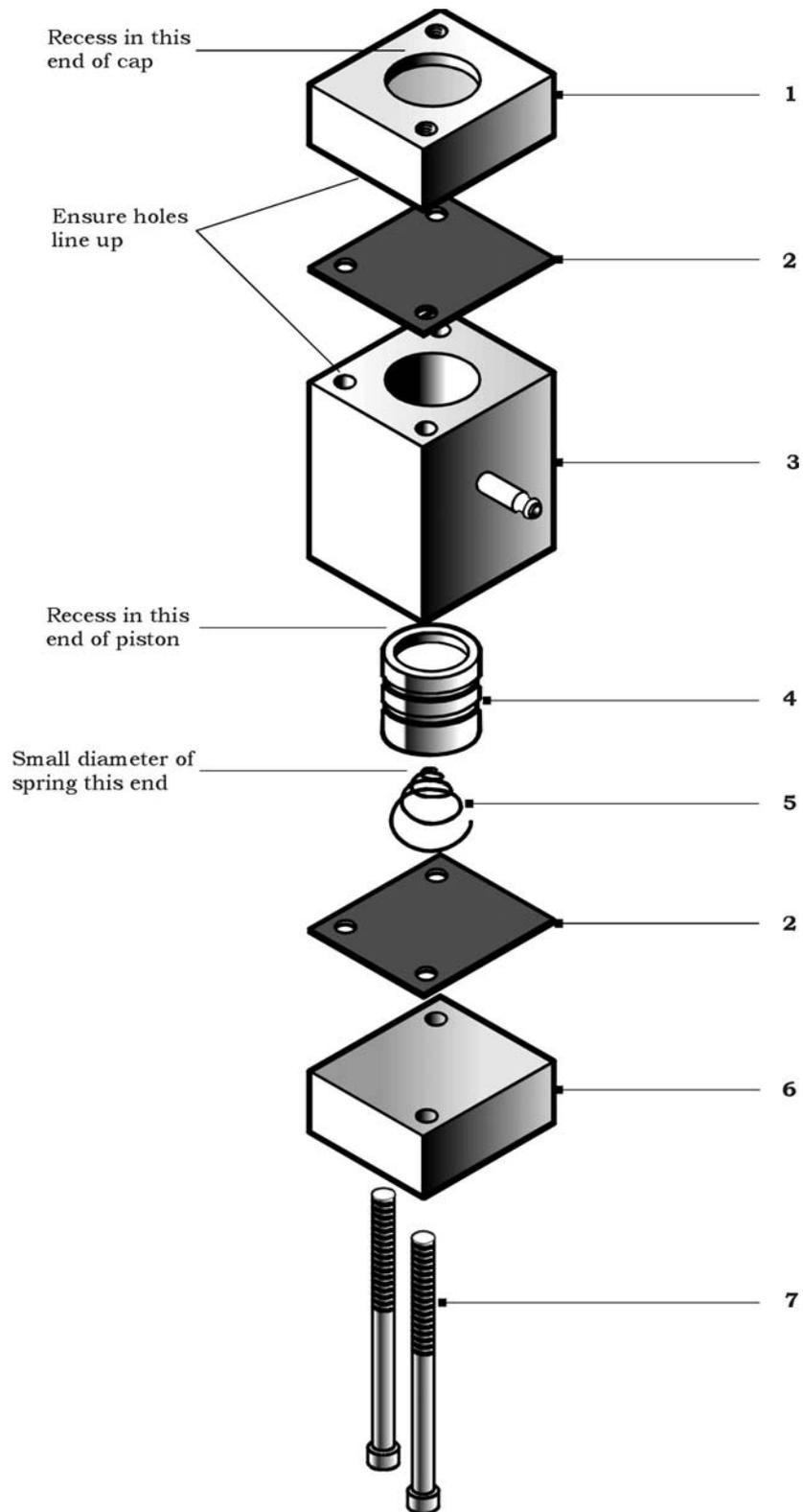
FIGURE 4
Stand Assembly



Key To Figure 4

Illustration Number	Part No.	Description	Qty per machine
1	S030	Level Adjustment Bracket	1
2	S031	Level Adjustment Nut	1
3	S149	M8 Plain Washer	1
4	S032	Level Adjustment Spring	1
5	S033	Level Adjustment Eyebolt	1
6	S015RH & LH	Stand Plate (Right Hand Shown)	1ea
7	S102	M6 x 16 Socket Head Cap Screw	4
8	S105	M5 x 6 Socket Set Screw	4
9	S027	Stand Plate Tie Rod	2
10	S041	Positioning Collar	2
11	S016S5	Seed Receiver Cup Black 5mm	18
12	S029	Mounting Bar Clamp Screw Assembly	2
13	S096	M5 x 12 Socket Head Cap Screw	16
14	S005	Discharge Plate	1
15	S103	M6 Wingnut	2
16	S028	Discharge Plate Mounting Bar	1
17	S095	Security Clamp	2
18	S26P	M5 x 8 Socket Head Cap Screw	11
19	S104	M6 Plain Washer	3
20	S107	M5 Plain Washer	4

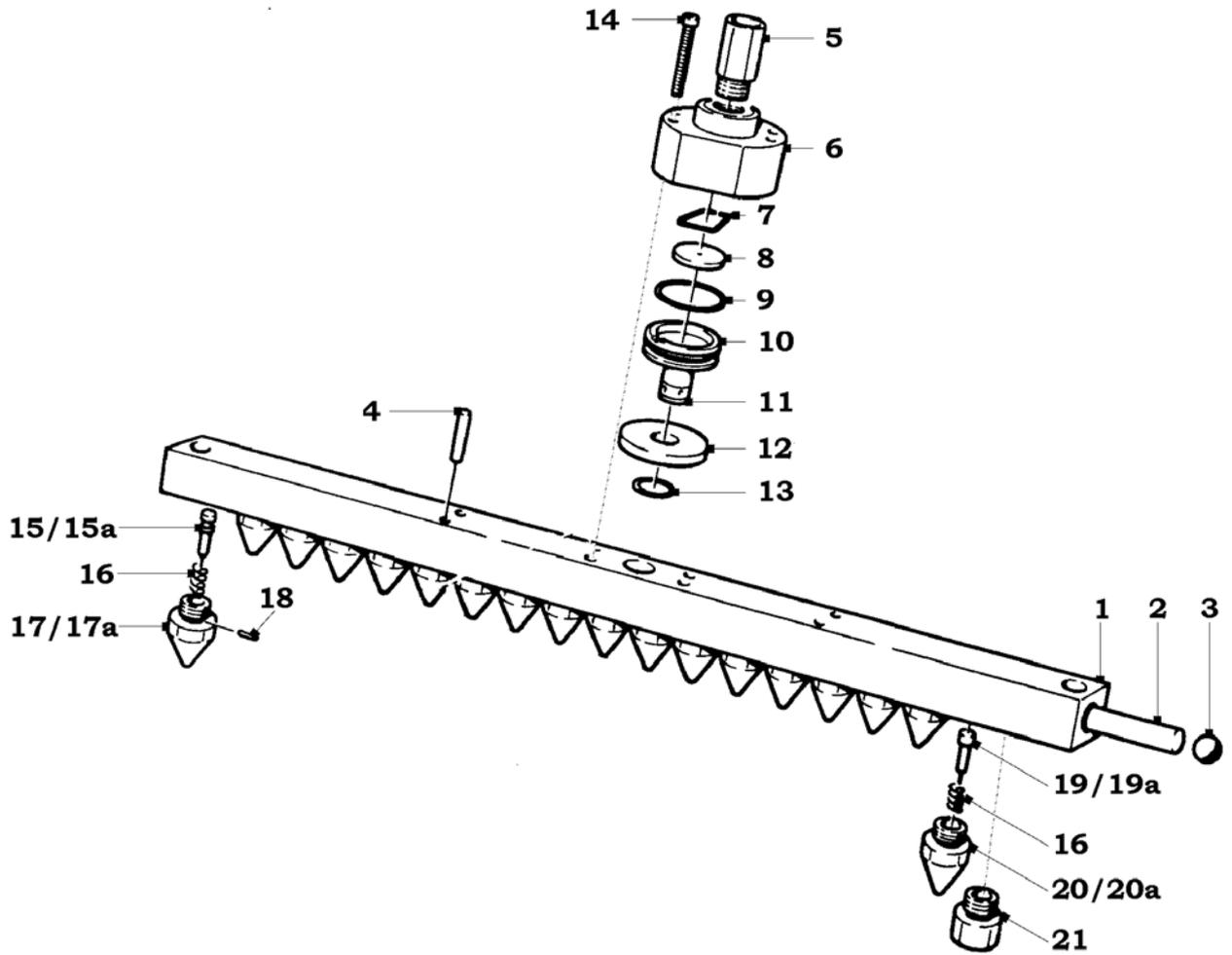
FIGURE 5
Tray Vibration Unit



Key To Figure 5

Illustration Number	Part No.	Description	Qty per machine
1	S014XA2	Silencer End	1
2	S014XA6	Gasket	2
3	S014XA1	Vibration Unit Body	1
4	S014XA4	Piston	1
5	S014XA5	Conical Spring	1
6	S014XA3	End Cap	1
7	P132	M4 x 50mm Socket-head Cap Screw	2

FIGURE 6
Self-Clearing Nozzle Bar



Key To Figure 6

Illustration Number	Part No.	Description	Qty per machine
1	S26LSC	S/C Bare Nozzle Bar - 18 row	1
2	S26SC05	Actuating Rod - 18 row	1
3	S26SC06	Seal Plug	2
4	S26SC09	Actuating Rod Guide Pin	4
5	S092	1/8" BSP x 6mm Male Push-in Connector	1
6	S26SC01	Cylinder Body	1
7	S26SC13	Valve Disc Cup	1
8	S26SC12	Non-return Valve Disc	1
9	S26SC10	Piston Seal	1
10	S26SC02	Piston	1
11	S26SC03	Thrust Pad	1
12	S26SC04	Piston Guide	1
13	S136-08	'O' Ring	1
14	S26SC07	M3 x 22 Socket Head Cap Screw	4
15	S26NLPL	Plunger - Lobelia	18
15a	S26NBPL	Plunger - Begonia	18
16	S26SC08	Spring	18
17	S26NL	Nozzle - Lobelia	18
17a	S26NB	Nozzle - Begonia	18
18	S26NBPIN	Pin	18
19	S26N3SCP	Plunger - 0.3mm	18
19a	S26N6SCP	Plunger - 0.6mm	18
20	S26N3SC	Self-Clearing Nozzle - 0.3mm	18
20a	S26N6SC	Self-Clearing Nozzle - 0.6mm	18
21	S26SC14	Nozzle Plug	8

The HAMILTON NATURAL SEEDER

09.0 INSTRUCTIONS FOR OPTIONAL EQUIPMENT

The following pages make up the instructions for the various optional equipment available for the Hamilton Natural Seeder:

Section 09.1	PLC Conveyor
09.1.1	PLC Controls
09.1.2	PLC Stroke Adjustment
09.1.3	PLC Maintenance
Section 09.2	Tray Indexing Mechanism
09.2.1	Tray Indexing Mechanism – Adjustment
09.2.2	Tray Indexing Mechanism – Safety Note
Section 09.3	Hand Operated Mechanism
Section 09.4	Universal Profile Bar
Section 09.5	Double Venturi Kit
Section 09.6	Self-Clearing Nozzle Bars – 0.3mm & 0.6mm
09.6.1	Self-Clearing Nozzle Bar 0.25mm
09.6.2	Needle Nozzle Bar
09.6.3	Begonia Nozzle Bar and Brush Strip
09.6.4	Lobelia Nozzle Bar and Brush Strip
Section 09.9.5	Vermiculite Coverer
Section 09.9.7	Roller Dibblers
Section 09.9.8	Seeder Height Adjustment Kit

09.1 THE PLC CONVEYOR

09.1.1 Controls

On top of panel:

- Power Switch: Push up for **ON**.
- Conveyor Switch: Push the switch up to operate the conveyor. This switch also operates the vibrator control valve.
- Coverer Switch: Switch **ON** to operate the coverer.
- Multi-Seeding Control: Select single, double or triple on the selector switch. The machine will cycle as many times as shown, before advancing to the next row.
- Dwell Control: Select short, none or long to vary the dwell time when the nozzle bar is in the seed tray at the pick-up position.
- Emergency Stop: The emergency stop button on the front of the control panel cuts all power to the machine. Press to stop - twist to reset.

Inside the panel:

The speed of the conveyor stroke cylinder (and hence the conveyor belt) can be altered by adjusting the flow regulator which is fitted to one of the large solenoid valves at the bottom of the cabinet. By loosening the adjuster screw, the conveyor will speed up. Tightening the adjuster screw will slow down the conveyor.

09.1.2 Stroke Adjustment

Vacuum formed plug trays:

The cylinder stroke is adjustable with the large adjusting screw and nut. With the air turned off at the compressor, the cylinder arm can be moved backwards and forwards by hand. Set the screw so that the belt moves slightly more than one tray pitch. If insufficient movement can be obtained, move the pivot pin (M6 screw) to a hole closer to the hub of the arm. The beam will sense the gaps in the tray and reset the cylinder before the clamp touches the cylinder body.

Plain trays or polystyrene plug trays

When using a plain tray, the seeder will be signalled to operate each time the cylinder fully instrokes (provided the beam is broken). Set the cylinder stroke so that it steps the tray exactly one pitch for each cylinder stroke. As the tray breaks the beam the cylinder will reset, and will seed at each full cylinder stroke thereafter, until the beam is re-established.

09.1.3 Maintenance

Lubrication

This should be carried out at least once every season.

Cylinder:

Remove the green and yellow pipes from the cylinder and put two or three drops of motor oil into each of the cylinder ports.

Cylinder Arm:

Apply two or three drops of motor oil between the end collars and centrepiece of the cylinder lever arm. This is to lubricate the one-way clutch bearing.

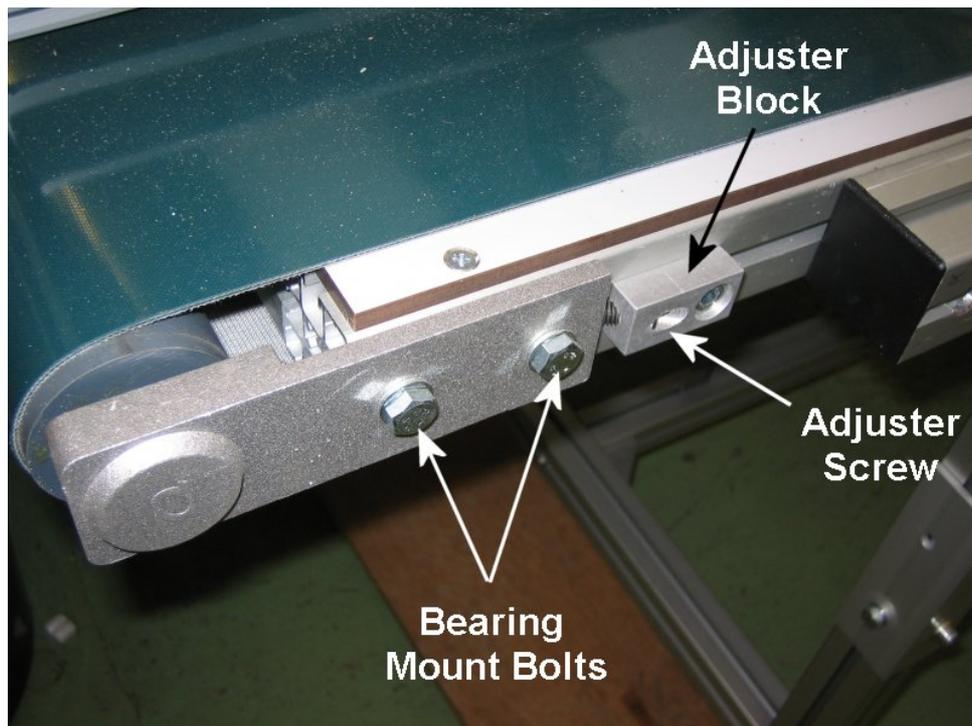
Conveyor Roller Bearings:

These are sealed-for-life units and should not require any maintenance.

Belt Tensioning

This is set at the factory, but the tension may require adjustment after a long period of running. There are adjuster blocks mounted on the outside faces of the conveyor body on the opposite end to the cylinder

Loosen the Bearing Mounting Bolts, but do not remove them, and make adjustments with the Adjuster Screws. Adjust both sides equally.



09.2.0 THE PLC TRAY INDEXING MECHANISM

Everything needed is supplied for assembling a complete, automatic, tray seeding machine, with the exception of a piece of plywood 60" x 24" x 3/4" thick and a few wood screws.

Unpack the units and place the seeding machine centrally on the plywood base 20" from the one end and affix with 4 wood screws through the holes provided in the machine end plate feet.

Attach the tray indexing unit to the seeder, using the two 5 mm x 16 socket head cap screws (provided in the spares kit) in the 3/4" x 1/4" bar under the rear of the Seeder.

Fix the angle bracket which supports the air cylinder end of the indexing mechanism to the plywood base using wood screws. At this stage one can adjust the Indexing Unit for level and clamp the angle bracket up tight.

Fix the PLC Control Panel to the baseboard at the rear end and to the right of the end of the indexing unit with two wood screws. Connect the remote control wires to the numbered terminals in the cabinet, and fix the remote to the baseboard, near the seeder head.

Reconnect all the pneumatic pipes using the colour code and clip them to the baseboard. (See "Barb Connections" below). Refer to 07.2.

Tape the black, red and 8mm pipes at the seeder end together and attach them to the base board so that they are held in a position that allows the seed trays to pass under the seeder freely. Adjust the tray guides to allow the seed tray to slide freely.

Connect the 8mm mains air connector to a suitable clean and dry air supply of 80 p.s.i.g. and 6 s.c.f.m. (preferably with its own filter.) Connect the power cable of the PLC control box to a suitable fused supply, preferably fitted with an RCD unit.

Barb Connections

All small bore pipe connections are colour coded barb type. A sharp modelling type knife is useful to cut the short identifying piece of pipe from the barb connections on the control cabinet and pusher unit. Square off the end of the pipe to be pushed on the bare barb, and pipe up the circuit with the correct colour type provide. Make the connections one by one to avoid mistakes.

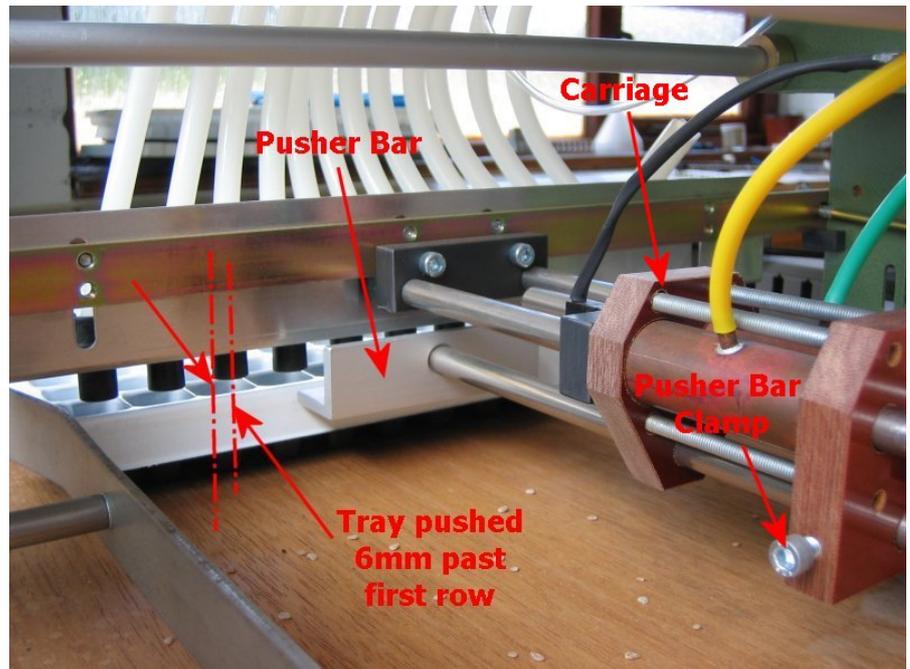
09.2.1 The PLC Tray Indexing Mechanism - Adjustment

1)

Turn off the air supply.

Slide the Carriage all the way to the front. Adjust the Pusher Bar so that it pushes the tray 6mm past the first row.

Tighten the Pusher Bar Clamp.

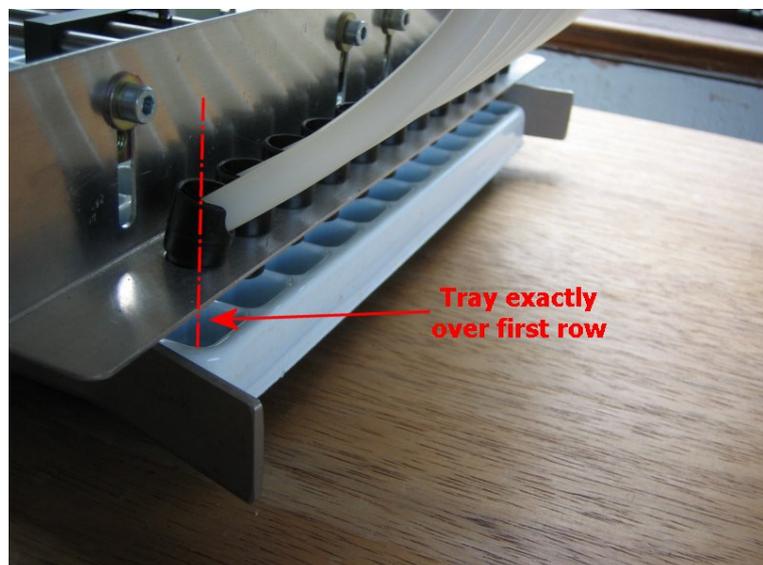
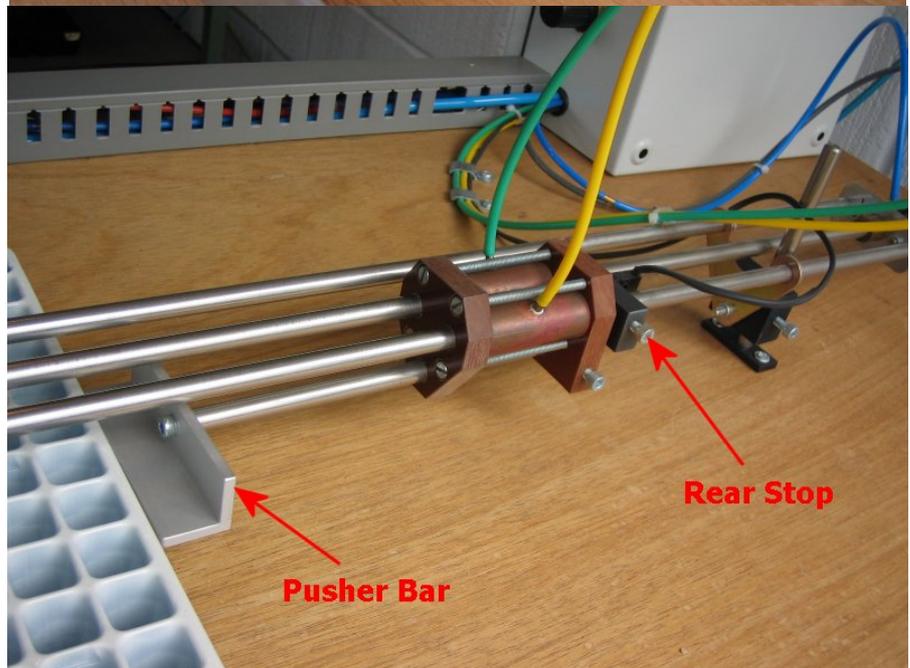


2)

Slide the Tray all the way to the rear.

Adjust the Rear Stop so that the first row of the tray is exactly under the seed receiver cups.

Tighten the Rear Stop screw.



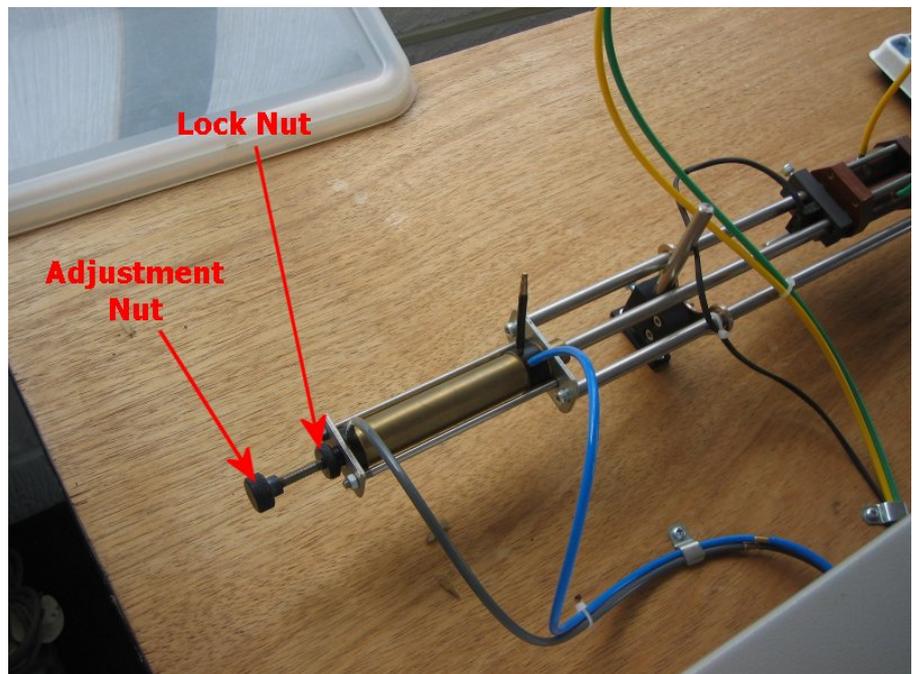
3)

Loosen the Lock Nut, and turn the Adjustment Nut so that the distance between them (the threaded portion) is approximately one step of the plug tray.

Turn on the air supply.

Start the Indexer, and turn the Adjustment Nut a small amount at a time, until the step of the Indexer is exactly one pitch of the tray.

Tighten the Lock Nut



09.2.2 The Tray Indexing Mechanism – Safety Note

Although the machine has been designed with safety in mind, do not put anything other than the seed tray under the machine during operation as although only a 30 lb. force acts directly on the indexing unit, it may cause discomfort if part of the body was placed in the mechanism.

09.3 THE HAND OPERATED MECHANISM

The mechanism is pre-assembled onto the seeder as shown on the exploded drawing.

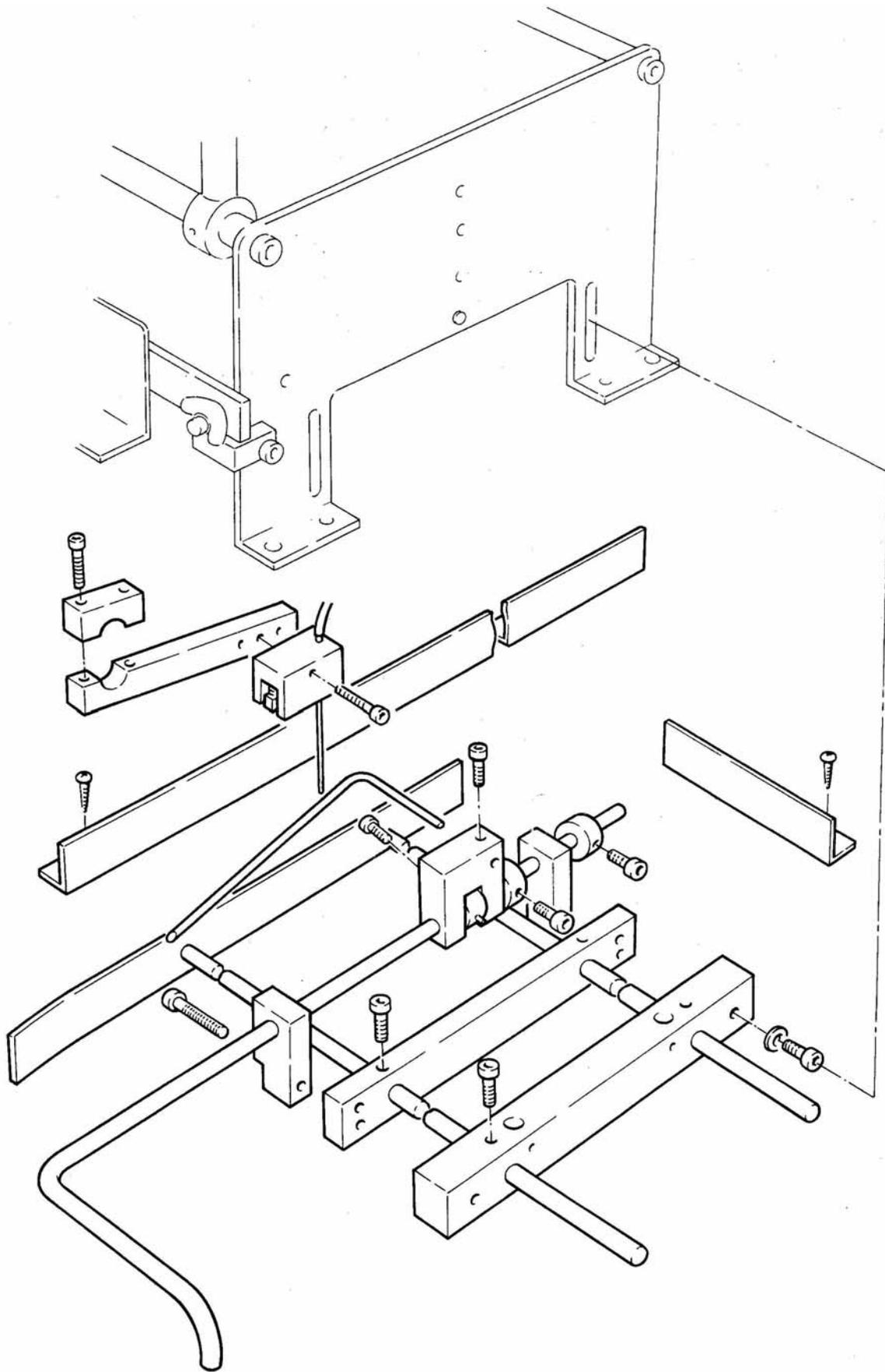
Operation.

Lower the indexing handle until it touches the baseboard. Load the tray in the front of the machine until it touches the rear stop angle. The indexing handle is then lifted to the vertical position. Push the indexing handle fully back and then pull forward to advance the tray. As the handle reaches the fully forward position, the swivel fork on the rod will touch the trip valve and actuate the seeder. Push the handle fully back and repeat the process to advance the tray to the next row, having allowed time for the seed to fall into the tray.

If the arm is held forward during seeding the nozzle bar will stay down in the seed tray slightly longer, giving a dwell effect, allowing more time for seed pick-up of small or irregular shaped seed. Multi-sowing can be achieved by not pushing the arm fully back between tray indexing motions.

Adjustment.

The width of trays can be adjusted by loosening the clamp screws and sliding the right hand guide rail in and out. Combined with this it is necessary to reposition the left hand guide angle on the board, in order to centralise the tray under the discharge plate. The back stop angle is positioned so that the tray can be pushed about 1/2" (12mm) past the first row seeding position. The collars on the actuating arm are positioned so that the indexing finger moves a little more than one tray pitch with each movement of the actuating arm. The trip valve is positioned such that it is triggered by the swivel fork just prior the tray reaching the seed position.



09.4 THE UNIVERSAL PROFILE BAR

Each Kit Contains:

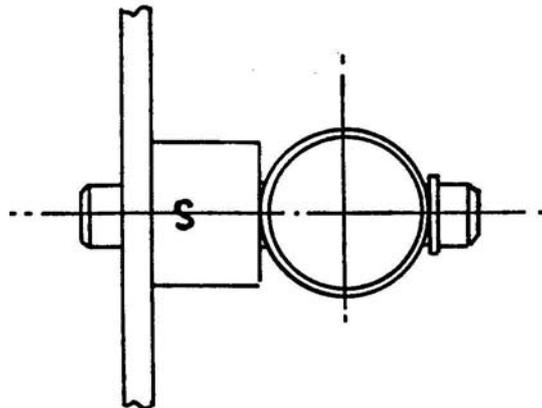
1	S012-14LS	Large Seed Profile Bar
14	S012-14R	Reducer-Adapters
1	S012-14P12	12-Row Spacing Plate (288)
1	S012-14P14	14-Row Spacing Plate (392)
1	S012-14B	Blank Spacing Plate
14	S012-14T	3/4" Discharge Tubes
14	S098	M4x6 Pan Head Screws
1	S26N6-14	14-Row 0.6mm Nozzle Bar
1	S055L	High Flow Venturi

The universal profile bar can be fitted to the Hamilton Natural Seeder in a matter of minutes. Firstly, remove the standard 18-Row profile bar and nozzle bar, along with the discharge tubes, receiver cups and the discharge plate. Save all the screws for refitting the new parts.

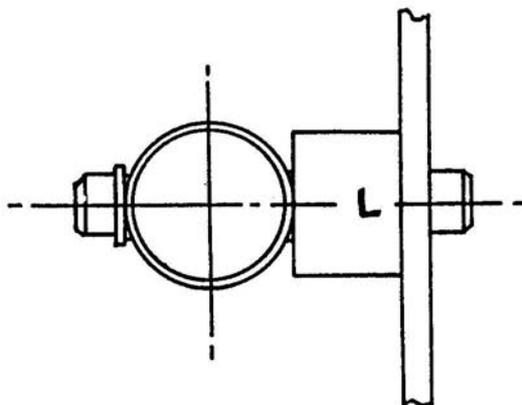
With the new bar, an increase of cylinder stroke is required, which is the reason that the cylinder mounting in the seeder cabinet has an eccentric mounting hole. Note the two points on the trunnion which are marked 'S' and 'L'.

Using the standard nozzle bar:

When the cylinder is viewed from the top of the seeder the point 'S' should be vertically upright as shown in the diagram below.



When using the Universal Profile Bar Kit the 'L' should be in the upright position as shown below:



The profile bar and nozzle bar can now be fitted. The spacing plates supplied are for 12-row, No 288 plug flats, or 14-row No 392, plug flats. If another spacing is required, then holes to suit have to be drilled and tapped into the blank spacing plate. If you do not have the tools required for this, your dealer will be able to help you out. The thread required is M4x0.7 pitch.

Fix the spacing plate to the discharge plate mounting bar and set the height to suit the flat to be sown. The discharge tubes can now be fitted. The tubes may need shortening so that they just clip onto the screws protruding from the spacing plate. If the tubes are left too long they may have too little slope on them, which can cause a hang-up of the seed in the tube.

Fit the high flow venturi (identified by the grooves machined on the large diameter) and you are ready to seed. Set the machine up as described in sections 0.5 and 0.6 of the operators manual. If required the nozzle bar can be packed up using washers, as described in section 06.1. When changing to smaller seed, the adapters supplied can be used with the standard discharge tubes, to save replacing the profile bar. If you do this, go back to using the receiver cups in the normal way.

If you refit the standard profile bar, this operation is the reverse of the above procedure, except for one point. The screws which hold the profile bar at each end should only be loosely assembled at first. When the discharge tubes have all been fitted this will hold the profile bar in the position that it was originally set. Now the screws can be tightened.

09.5 THE DOUBLE VENTURI KIT

Each Kit Contains:

1	S26N115	14-Row 1.15mm Nozzle Bar
1	S055L	High Flow Venturi
1	S054SA	Venturi Housing Assembly
1	S096	M5x12 Socket Head Cap Screw
8	S107	M5 Plain Washer
1	S132	Air Blast Reservoir
2	S135T	Tee Piece
3	S080P	Plugs
1	DV003	0.4mm Restrictor
1	DV004	Nylon Tube Pack

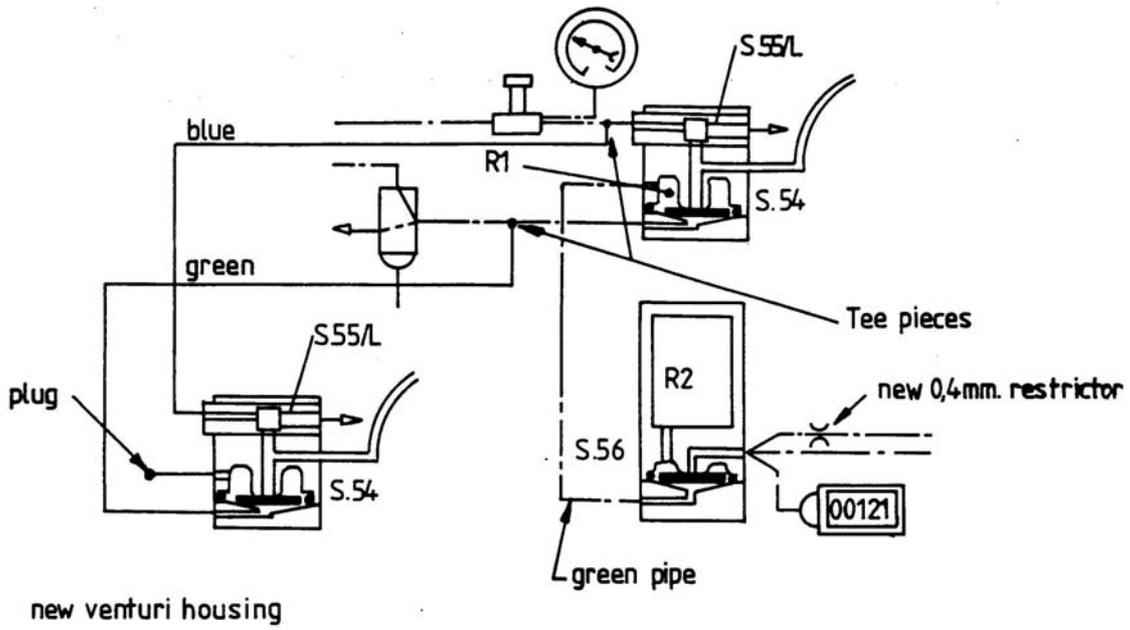
This kit is for use with the Universal Profile Bar for sowing very large seed such as squash. All but the heaviest seed can be sown with very good results. It can be fitted to the seeder in a matter of minutes, and disconnected for normal seeder operation in seconds. The two high flow venturies consume much more air than the standard type, so do not leave the system connected when not in use. Also make sure that the compressor can cope with the extra loading.

Drill a hole in the seeder end plate as shown on the sketch and screw the new venturi housing onto the outside of the end plate with the vacuum pipe pointing towards the control cabinet, and the venturi inlet pointing backwards. Fit the nozzle bar, using three or four packing washers (standard M5 washers) to space the nozzles away from the seed tray. Fine adjustments can be made with the normal controls, but major changes have to be made with these washers. Connect the vacuum pipes to the nozzle bar.

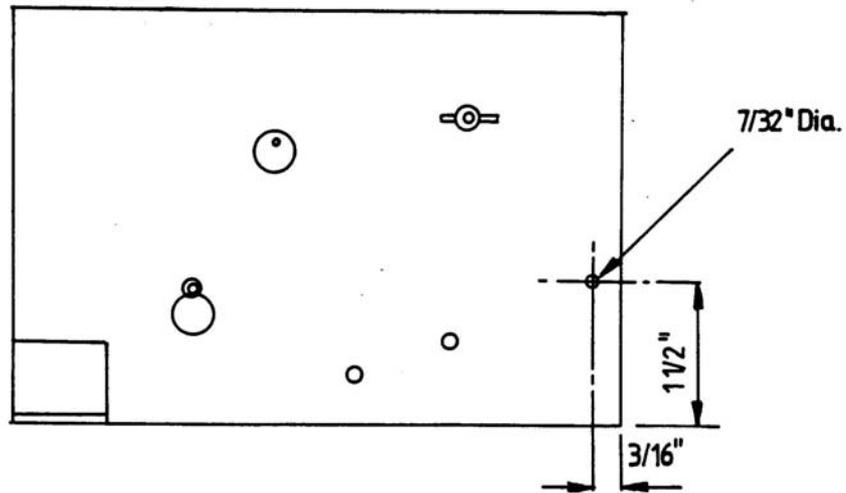
Two air connections have to be made in the control cabinet with the tee pieces provided as shown on the circuit diagram, use the colour coded pipes supplied. Cut the existing green pipe between the venturi housing and the poppet valve about 1" from the poppet end and fit the centre stem of one tee piece to this. Shorten the green pipe if necessary and connect to the tee. Connect the new green pipe to the other branch of the tee and lead it through one of the holes near the cylinder mount, under the seed tray, and connect to the cap of the new venturi housing. Plug the other barb connection in the body of the new housing with the plug provided (if not already plugged). Repeat this operation for the venturi connections using blue tube.

On certain large seed it may be necessary to slow down the speed of the nozzle bar movement to give a delay at the pickup point. For this a smaller, yellow restrictor is provided to replace the existing pink one on the distributor valve (keep this safe when removed). When using high vacuums for large seed fit the air blast reservoir supplied, in accordance with section 06.1 of the operators manual.

When reverting to smaller seed, remove the connections to the additional venturi housing at the tee pieces, and insert the plugs provided. The housing can be left in position if required.



AIR CIRCUIT FOR DOUBLE VENTURI SYSTEM



DETAILS OF MOUNTING HOLE IN END PLATE - NOT TO SCALE

09.6 THE 0.3 & 0.6MM SELF-CLEARING NOZZLE BARS

Fitting

The self-clearing nozzle bar is fitted to the seeder in exactly the same way as the standard nozzle bar. The discharge air is used to eject the cleaning pins when the seed is discharged.

Important Setting Note

If the nozzles are adjusted too close to the profile bar, they can be damaged as the nozzle returns to the seed tray because the pins are still protruding when the seeder starts the pickup stroke, and hit the profile bar as they pass, thus bending the pins. Seed wiping, such as lettuce, therefore, is not possible with the self-clearing bar, revert to the standard nozzle bar for this.

Cleaning

Periodically, dependent on use, it will be necessary to clean the nozzles and wires to remove traces of seed coating and dust.

Carefully unscrew all the nozzles and remove the springs and wire holders, ensuring that all components are kept in sets. Wipe any surface dirt from the plungers and springs. Wipe out the bore of the nozzle, and run a cleaning wire through the hole. Blow out each nozzle using a short piece of 3/16" nylon tube in the vacuum cleaner outlet of the seeder.

Carefully remove the four screws holding the cylinder to the top of the nozzle bar and lift off the assembly. Remove the bottom cap (note that the 'O' ring faces out), and pull out the piston. Remove the spring clip and rubber disc from the piston, and carefully ease off the large 'O' ring seal around the piston. Carefully clean off all components. Re-assemble the cylinder in the reverse order, using a very small amount of silicone grease to lubricate the piston 'O' ring in the cylinder bore.

Before replacing the nozzles and cylinder blow out the holes of the nozzle bar itself to remove dust and dirt. Carefully put together each nozzle assembly and check operation manually, before screwing them back into the bar. Test using the nozzle cleaning pipe connected to the vacuum cleaner outlet.

09.6.1 THE 0.25MM SELF-CLEARING NOZZLE BAR

Fitting

The self-clearing nozzle bar is fitted to the seeder in exactly the same way as the standard nozzle bar. The discharge air is used to eject the cleaning pins when the seed is discharged.

Important Setting Note

If the nozzles are adjusted too close to the profile bar, they can be damaged as the nozzle returns to the seed tray because the pins are still protruding when the seeder starts the pickup stroke, and hit the profile bar as they pass, thus bending the pins. Seed wiping, such as lettuce, therefore, is not possible with the self-clearing bar, revert to the standard nozzle bar for this.

Cleaning

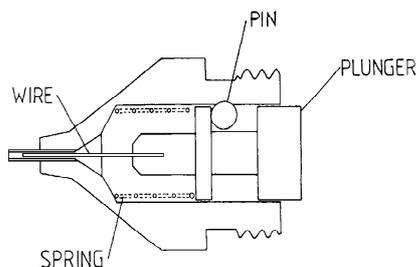
Periodically, dependent on use, it will be necessary to clean the nozzles and wires to remove traces of seed coating and dust.

Carefully unscrew all the nozzles and remove the cross pin, springs and wire holders, ensuring that all components are kept in sets. Wipe any surface dirt from the plungers and springs. Wipe out the bore of the nozzle, and run a cleaning wire through the hole. Blow out each nozzle using a short piece of 3/16" nylon tube in the vacuum cleaner outlet of the seeder.

Carefully remove the four screws holding the cylinder to the top of the nozzle bar and lift off the assembly. Remove the bottom cap (note that the 'O' ring faces out), and pull out the piston. Remove the spring clip and rubber disc from the piston, and carefully ease off the large 'O' ring seal around the piston. Carefully clean off all components. Re-assemble the cylinder in the reverse order, using a very small amount of silicone grease to lubricate the piston 'O' ring in the cylinder bore.

Before replacing the nozzles and cylinder blow out the holes of the nozzle bar itself to remove dust and dirt. Carefully put together each nozzle assembly and check operation manually, before screwing them back into the bar. Test using the nozzle cleaning pipe connected to the vacuum cleaner outlet.

There is an easy way to assemble these nozzles after cleaning. Simply rest the plunger in the nozzle, and hold it against the back edge of the vibrating seed tray of the machine. The vibration of the tray will transmit to the nozzle and align the wire in the needle hole and it will drop into place almost instantly.



09.6.2 THE NEEDLE NOZZLE BAR KIT - S26NN

The kit contains:

S26NN1	20	0.1mm Needle Nozzles (not marked)
S26NN25	20	0.25mm Needle Nozzles (marked 25G)
S26NN5	20	0.50mm Needle Nozzles (marked 21G)
S26NNB	8	Blanking Tip
S26LNA	1	Nozzle Bar
S26NNN	18	Nozzle Holding Screws
S26NNS	18	Nozzle Sealing 'O' Ring
S26NNW	18	Nylon Washer
S26NC	1	Cleaning Adapter

Instructions

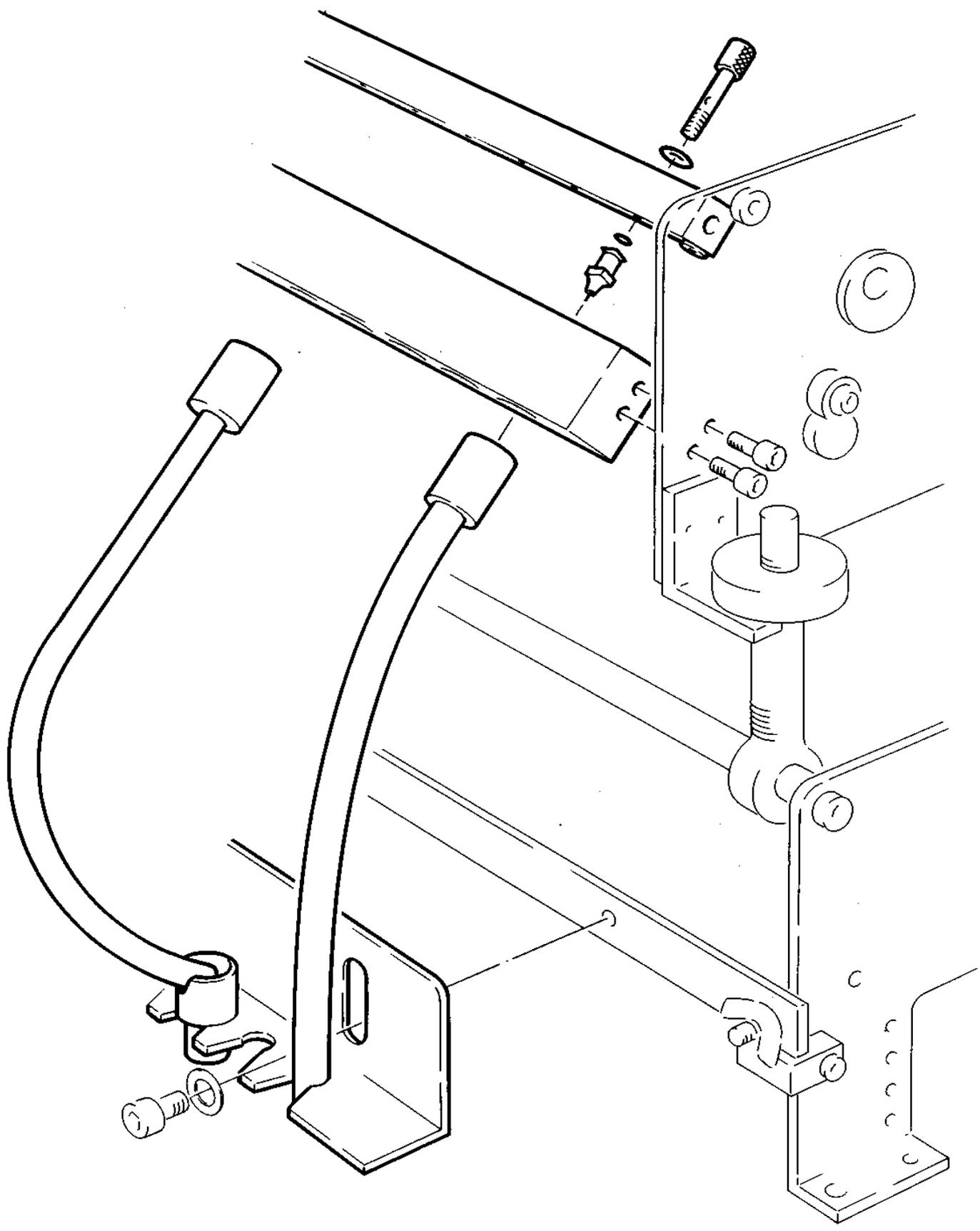
1) Fit the required needle nozzles to the nozzle bar by pushing the brass holding screws (fitted with nylon washers) through the bar, fitting the 'O' Ring seals to the screws, and screwing the nozzle to the holder by twisting the knurled end of the holder, taking care not to cross thread the nozzle (see diagram). The nozzles only need to be hand tight to seal against the rubber nozzle seals and lock against the nozzle bar. If a small spanner is used to tighten the nozzles, use only very light pressure. Do not overtighten, as this will cause damage to the nozzle and holder.

2) Remove the small protective plastic tube from the end of each nozzle. Fit the nozzle bar to the seeder in the normal way, taking care not to damage the needles. The vacuum pipe fitting on the nozzle bar should face forward.

Please note: - Using excessive vacuum pressure with the 0.1mm nozzles may prevent the seeds being discharged from the nozzles at the discharge point. This can be checked by holding the nozzle bar with a full line of seeds on the nozzles and pressing the green manual button on the seeder.

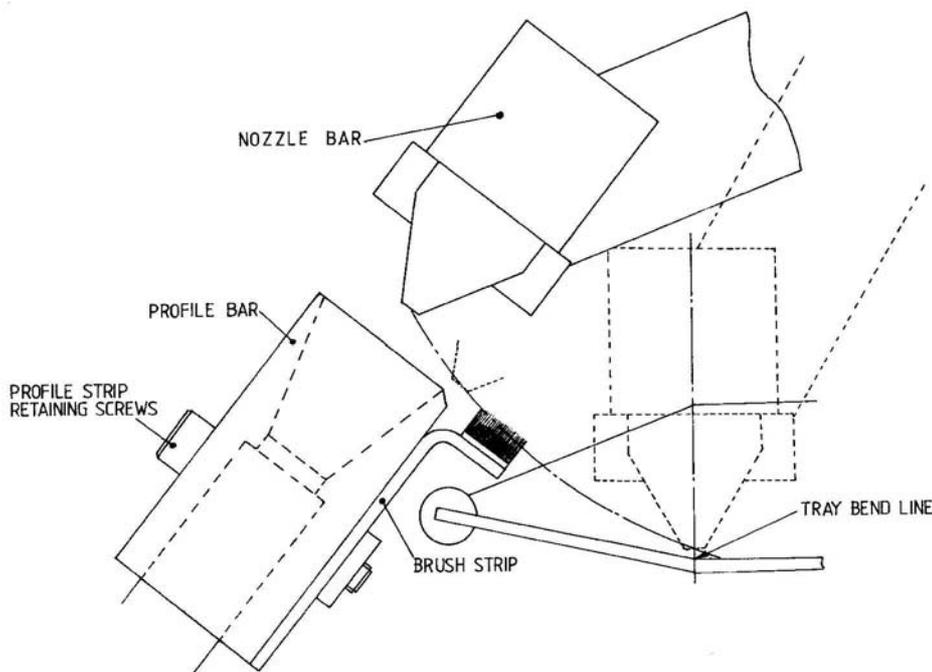
Nozzle Cleaning

If nozzles become blocked with seed dressing etc., the needles can be cleaned without removing them from the nozzle bar or the seeder, using the nozzle/manifold cleaning pipe adapter (part no. S084), supplied with your seeder. Push one end of the 3/16" nylon tube into the vacuum cleaner port on the seeder and push the other end, with the adapter, into the vacuum pipe fitting on the back of the nozzle bar. Push the red button on the seeder several times to force high pressure mains air through all the nozzles. If a nozzle becomes heavily blocked, remove the nozzle from the bar and clean using the cleaning block connected to the vacuum cleaner port.



09.6.3 THE BEGONIA NOZZLE BAR AND BRUSH STRIP

- 1 As supplied, the nozzle bar is set up for sowing all 18 rows. If this has to be changed, replace nozzles with the plugs provided. Take care when removing the nozzles as there are small location pins which may drop out. The rubber caps in the kit are to put around the threads of the unused nozzles to retain the pins during storage.
- 2 Remove the existing nozzle bar.
- 3 Undo the two small screws in the front of the profile bar and remove the stainless steel profile strip.
- 4 Tilt the back of the seed tray upwards and place the brush strip in the same position as the stainless steel profile strip.
- 5 Replace the two retaining screws, using the nuts provided, on the underside of the brush strip. Lightly tighten screws to clamp brush strip to the profile bar.
- 6 Set the nozzle bar to profile bar clearance, i.e. Seed size indicator to the zero position.
- 7 Adjust the brush strip to lightly brush the tip of the nozzles, when the nozzle bar is raised and lowered manually. See illustration.
- 8 Tighten the two small screws on the front of the profile bar, thus locking the brush strip in position.
- 9 Read the "Important Notes" section carefully.



IMPORTANT NOTES ON THE BEGONIA NOZZLE BAR

It should be noted that although similar in appearance to the conventional nozzle bars, the Begonia nozzle bar has nozzles of a unique construction. The wire in the nozzle retracts to form a small pocket that will contain two seeds. As the nozzle passes through the brush, all but these will be wiped off.

To achieve successful seeding of Begonia it is essential that the seeds vibrate freely and separately in the seed tray, and do not stick to any of the machine components that they may contact while travelling to the growing media.

Unfortunately, due to the size and weight of the Begonia seed, it will adhere to the slightest amount of grease or moisture, even a finger mark. All components must therefore be clean and dry. All metal components and the vacuum cleaner jars should be cleaned with acetone or a similar spirit, dusted with talcum powder and blown clear with an air line. This applies to the seed tray, profile bar and seed receiver cups. We suggest that the talc is applied with a small artists paint brush.

The discharge tubes, as extruded, have a fine matt film over the bore that impedes the passage of some seeds, especially Begonias. This film can easily be removed by using a pull-through of cloth wadding. Follow this operation by passing a small quantity of talc through the tubes, shaking to coat thoroughly, and blow with the air line to clear.

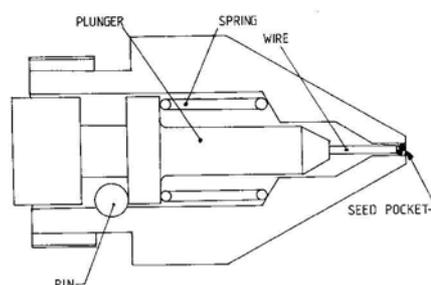
Dryness of the seed, seed tray, and tubes may be maintained by setting up a small filament lamp of approx. 60W above the seeder.

It is very important that the applied talc is blown clear with an air line until only a barely visible coating is left. Free talcum powder left in the seed tray can have an adverse effect as it tends to build up on the seeds until they are encapsulated, and in this state they tend to clump together and remain stationary in the seed tray and will not float towards the nozzles to be picked up.

As the Begonia seeds are so small and dark in colour, it is not possible to see them when they are deposited in the growing media. To test the seeding pattern we suggest that periodically a strip of damp white paper is laid across the seed tray for the seeds to fall on. The seeds adhere to the paper, then with a white background the seeds become clearly visible.

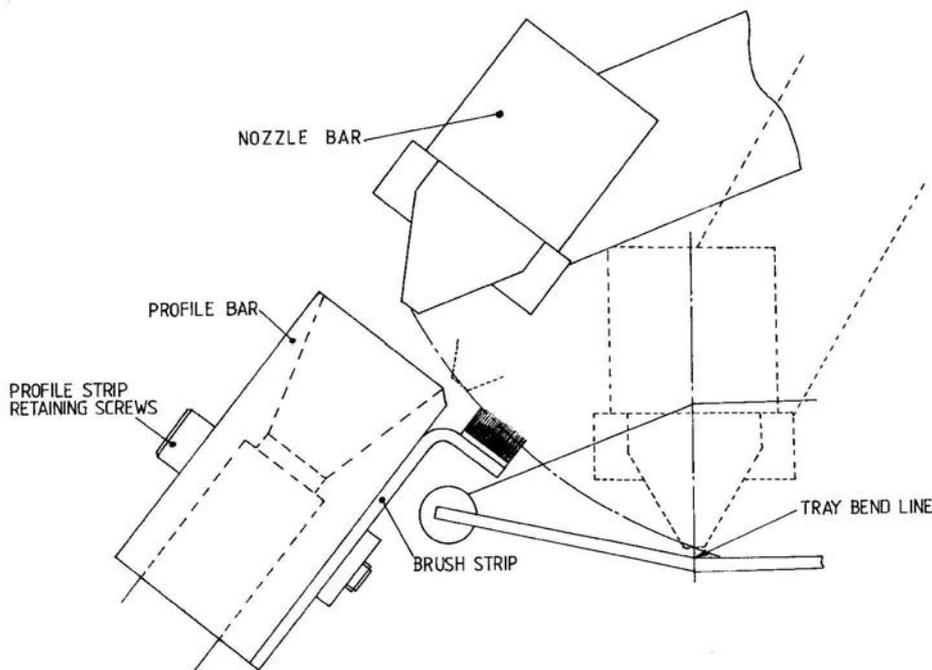
After long runs, a small amount of seed may accumulate in the brush. This may be removed with the glass jar vacuum cleaner.

Our tests have shown that best results are obtained with the vacuum setting at 10 P.S.I., seed size at 0, piston stop at 0, and vibration control valve set to 1.5.



09.6.4 THE LOBELIA NOZZLE BAR AND BRUSH STRIP

- 1 As supplied, the nozzle bar is set up for sowing 14 rows. If this has to be changed, replace nozzles or plugs as appropriate. The rubber bands around the spare nozzles are for transit only and should be removed before fitting. The bands retain small location pins, so take care they do not drop out on assembly into the bar.
- 2 Remove the existing nozzle bar.
- 3 Undo the two small screws in the front of the profile bar and remove the stainless steel profile strip.
- 4 Tilt the back of the seed tray upwards and place the brush strip in the same position as the stainless steel profile strip.
- 5 Replace the two retaining screws, using the nuts provided, on the underside of the brush strip. Lightly tighten screws to clamp brush strip to the profile bar.
- 6 Set the nozzle bar to profile bar clearance, i.e. Seed size indicator to the '3' position.
- 7 Adjust the brush strip to lightly brush the tip of the nozzles, when the nozzle bar is raised and lowered manually. See illustration.
- 8 Tighten the two small screws on the front of the profile bar, thus locking the brush strip in position.
- 9 Read the "Notes" section carefully.



Notes on the Lobelia Nozzle Bar

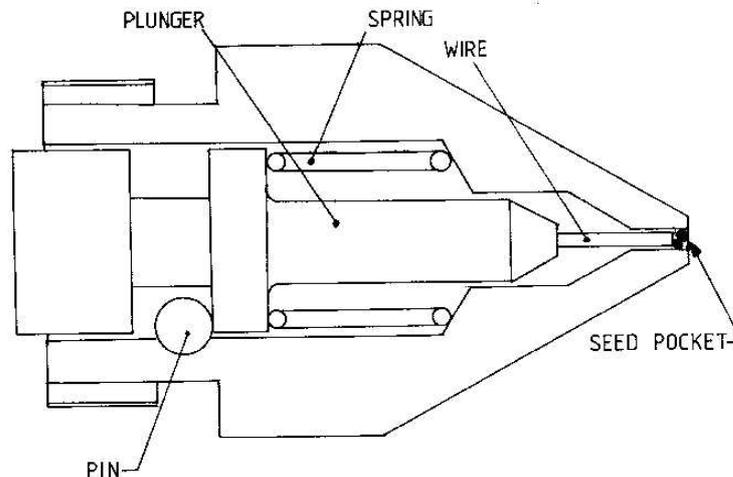
It should be noted that although similar in appearance to the self-clearing nozzle bars, the Lobelia nozzle bar has nozzles of a unique construction. The wire in the nozzle retracts to form a small pocket that will contain 5-6 seeds. As the nozzle passes through the brush, all but these will be wiped off.

The discharge tubes, as extruded, have a fine matt film over the bore which impedes the passage of some seeds, especially Lobelia. This film can easily be removed by using a pull-through of cloth wadding.

As the Lobelia seeds are so small and dark in colour, it is not possible to see them when they are deposited in the growing media. To test the seeding pattern we suggest that periodically a strip of wet white paper is laid across the seed tray for the seeds to fall on. The seeds adhere to the water, then with a white background the seeds become clearly visible. Make sure that the wet paper does not come in contact with the seed receiver cups.

After long runs, a small amount of seed may accumulate in the brush. This may be removed with the vacuum cleaner.

Our tests have shown that best results are obtained with the vacuum setting at 15 P.S.I., seed size at 3, piston stop at 0, and vibration control valve set to 1.5.



09.9.5 VERMICULITE COVERER

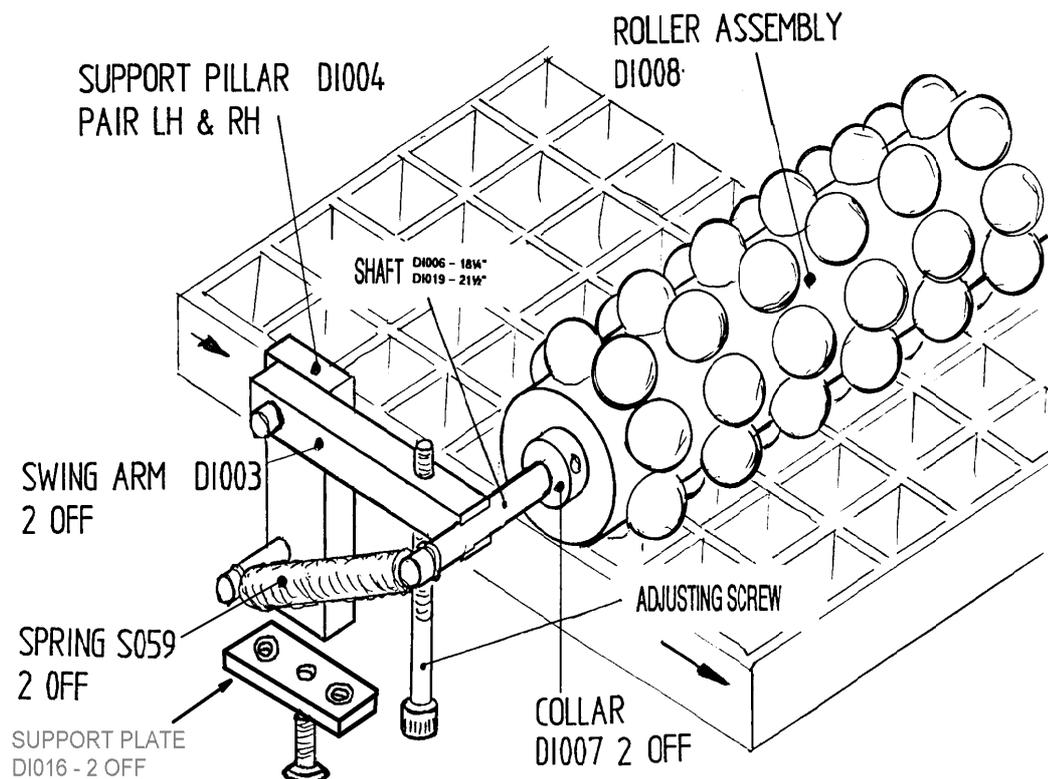
There are only two adjustments for the Vermiculite Coverer, the stroke of the actual cylinder, and the height of the gate plate. Never make adjustments while the machine is running.

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

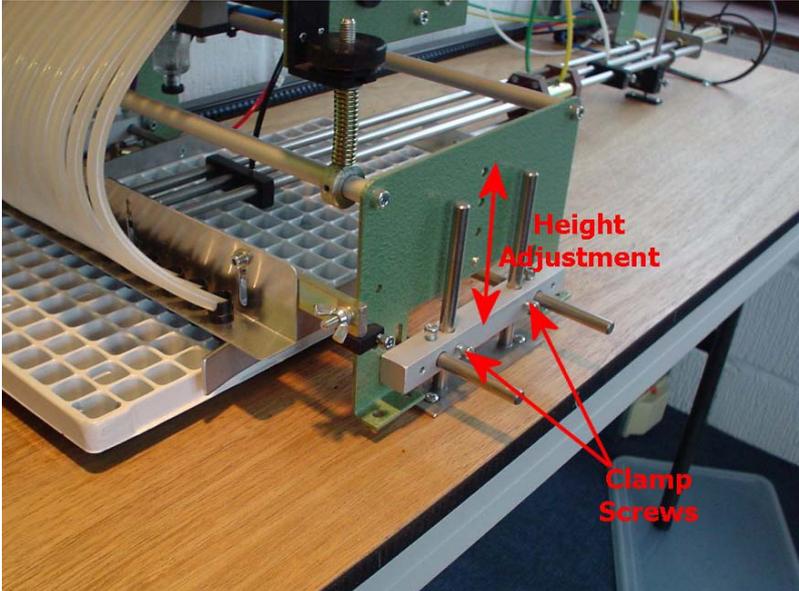
The cylinder stroke can then be set for the covering thickness, moving it inwards will increase it.

09.9.7 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.

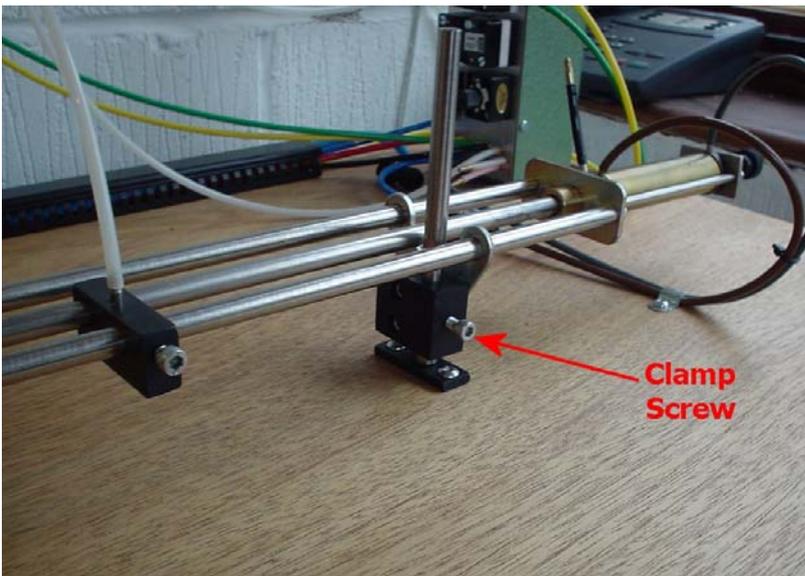


09.9.8 - Seeder Height Adjustment Kit (HK200)

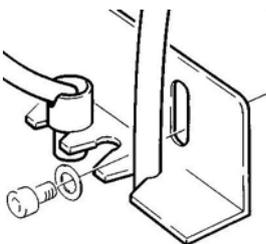


One advantage of using the Height Adjustment Kit is that the discharge tubes can be left their original lengths, and do not require shortening when using taller trays. One set of tubes can be used for both short and tall trays.

Loosen the clamp screws, and set the height of the machine so that the tips of the receiver cups are 8mm above the surface of the tray.



Make sure that the rear of the tray indexing mechanism is adjusted accordingly. The stainless steel rods of the indexing mechanism must remain parallel to the mounting board.



When using the larger diameter discharge tubes the plate should be cut with 'keyhole' slots, so that the tubes can snap into place to avoid kinking when fitting. The machine height should be adjusted so that the tips of the tubes are about 10mm above the surface of the tray.