ZENO

2 & 3 Row Potato Planters

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IMPORTANT

This operator's handbook should be regarded as part of the machine. Suppliers of both new and second-hand machines are advised to retain documentary evidence that this handbook was supplied along with the machine.

On installation of the machine (i.e. starting off in the field), the New Machine Installation Record Card should be completed by the dealer/distributor and be countersigned by the customer. The document is proof that the correct procedures have been followed.

The New Machine Installation Record Card should be returned to Standen Engineering Limited within 7 days of installation. Failure to do so may invalidate the machine warranty.

On delivery check that the machine is as ordered and has not been damaged in transit. Please report any shortfall to your Standen dealer.

The contents of this handbook, although correct at the time of publication, may be subject to alteration by the manufacturers without prior notice.

Standen Engineering Limited operates a policy of continual product development. Therefore, some illustrations and/or text within this publication may differ from your machine.

CONTENTS

1.1 INTRODUCTION

Introduction to the Handbook

This handbook provides the information for the operation, adjustment and maintenance of your **STANDEN ZENO Potato Planter**. To enable you to achieve the best results from the machine, the manufacturer recommends that you read the handbook thoroughly prior to using the machine for the first time.

Record below the details of your machine.

Dealers name.....…….

Address.....

.....

Telephone number.....……

Machine serial number.....…

Date purchased.....

Date started work.....

This symbol indicates important safety messages within this handbook. When you see this symbol, be alert to the possibility of injury to yourself or others and/or damage to the machine and carefully read the message that follows.

Throughout this handbook the terms 'front', 'rear', 'left-hand' (LH) and 'right-hand' (RH) are derived from the tractor driver's position facing forward in the normal direction of travel.

Adjustments to the machine may have to be made singly or in combination according soil conditions. Always allow the machine to settle to a new setting before making further adjustments.

Recommended lubrication and maintenance instructions are included in this handbook and if followed will help to keep the machine in a safe working condition.

Warranty

Should the machine suffer any faults or defects within the warranty period, please contact your dealer. The warranty shall be effective only if the dealer is informed of any such defect as soon as practicable upon discovery.

Replacement Parts

Recommended replacement parts are designed for your machine and have the full backing of the warranty. Only when recommended parts are used can responsibility be considered under the terms of the warranty.

The rear section of this handbook contains lists of spare parts available through your Standen Agents. Each illustration shows a complete unit or assembly in exploded form. Standen's policy of continual product development means that components or even complete assemblies are redesigned from time to time. Where possible the modifications are shown in the remarks column.

The first printing of each page in the spare parts section is identified as issue 1 at the foot of the page. When a complete unit or assembly has been redesigned the appropriate pages are revised and printed as issue 2. The revised pages are filed behind the existing issue so that a complete modification history is gradually built up. When using an illustration and parts list it is essential that both are of the same issue.

Always quote the full serial number of your machine when ordering spare parts.

1.3 SAFETY PRECAUTIONS

Safety

The STANDEN ZENO Potato Planters have been designed to comply with current Safety Regulations. However, as with all machinery there will be inherent dangers whilst operating and carrying out maintenance on the machine. The following list of precautions should therefore be brought to the attention of all persons operating and working on the machine. The list is not exhaustive. All machinery is potentially dangerous and great care must be exercised by the operators at all times. Standen Engineering Limited will not accept liability for damage or injury caused by their products except when such liability is specifically imposed by English statute.

The machine must never be operated by untrained personnel or children.

The tractor must be of a suitable size to lift the implement safely. This may entail the fitting of front weights to counterbalance the machine when in the raised position.

Always check that the machine has been correctly mounted to the tractor before setting off on operations and the stabilizers are correctly set.

Never set machinery in motion before ensuring that everyone in the vicinity is aware of your intentions.

Never allow children or animals in the vicinity where machines are working and never allow anyone to ride on the machine.

Never attempt to fit drive chains or drive belts to the machine while the drive sprockets or pulleys are in motion.

Normal safe working procedures should be adopted at all times. Reduce speed when transporting the machine on sloping ground.

Do not work on ground where there is a possibility of overturning or across steep slopes.

The working area should be kept clear and free of obstructions at all times. Be alert for hidden obstructions. Should the machine hit an obstruction, stop and check for damage before proceeding.

Wear substantial or proper safety footwear. Avoid loose clothing near moving parts. Wear gloves when handling the implement or parts with sharp edges.

Before carrying out any work on the machine, lower the machine to the ground, switch off the tractor engine, apply the handbrake, remove the ignition key. Never work on or pass under the machine when it is raised on the tractor hydraulic linkage.

SAFETY PRECAUTIONS 1.4

When left free standing i.e. not attached to the tractor, the machine must be on level ground.

The operator must not leave the tractor seat until the machine has been lowered to the ground, the tractor engine switched off, the handbrake applied and the ignition key removed.

Never reverse or turn unless the machine is in the raised position.

All guards, covers, warning transfers and safety devices must be correctly fitted and operable at all times.

Inspect the machine on a regular basis and replace damaged or worn parts as necessary.

Never operate the machine in a state of disrepair.

Only transport the machine at a speed suitable to the prevailing conditions. Be aware of the weight and overall length of the machine at all times.

When in transport keep the hopper empty. Always fill the hopper in the field. Transporting with a full hopper causes strain on both planter and tractor and will pack the potatoes in the hopper causing 'bridging' when planting commences.

Always ensure road lights are clean and in good working order.

Always lock the raised hopper with the stays before working underneath. Always unlock the hopper again before lowering.

Always use mechanical or additional help when lifting heavy parts.

Regularly check hydraulic hoses for chafing or damage and replace as necessary.

Care must be taken when carrying out any work on the hydraulic system. Even when stopped and disconnected from the tractor, residual pressure will exist within the hydraulic system. Therefore, before commencing any work on the hydraulics ensure that the system is free of residual pressure.

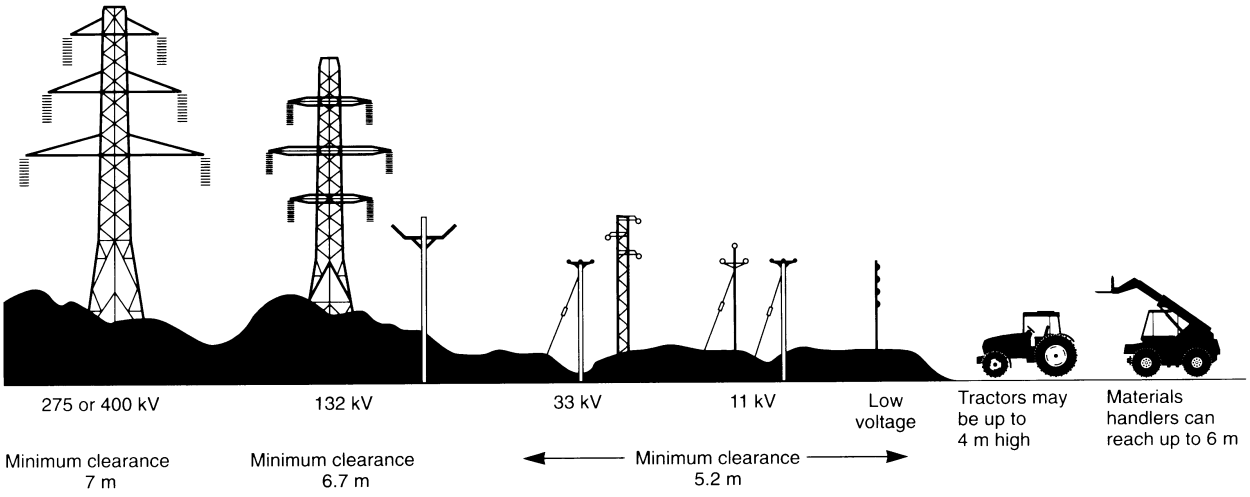
Safety is the responsibility of the persons working with this machine. Think "safety" at all times. Read and remember the contents of this handbook.

HSE information sheet

HSE Health & Safety Executive

Working safely near overhead power lines

Agriculture Information Sheet No 8 (rev)



Be aware of line heights

Introduction

About five people are killed every year in accidents involving overhead power lines during agricultural work. Machinery (eg combines, tipping trailers and loaders); equipment (eg irrigation pipes and ladders); and activities (eg stacking) are often involved. Contact with the lines does not need to be made. Electricity can flash over when machinery or equipment gets close to overhead lines.

Most incidents involve high-voltage lines supported on wooden poles, but the dangers of other power lines cannot be ignored.

This information sheet outlines the steps you can take to reduce the risks when working near overhead power lines. Remember the Electricity at Work Regulations 1989 apply to work activities carried out near power lines.

Planning precautions

Consult your local electricity company. They will provide free information and advice about precautions and safe working procedures which can be followed near power lines.

Find out the maximum height and maximum vertical reach of your machines and those used by contractors.

Find out the routes of **all** overhead lines on your land or near your boundaries. Mark them on the farm map. The electricity company will give you this information.

Make sure you have information about all the lines on your land - if not, contact the owners of those lines.

The farm map can be used as a reference when planning cropping or other work, instructing machine operators and contractors, or buying new equipment.

In cases where there is a significant risk area, it is sensible to discuss the following measures with the electricity company:

- **access**: creating alternative access points and routes - this is often the cheapest option;
- **divert lines**: benefits can arise from burying lines or changing routes - an option particularly suited to farmyards;
- **barriers and goal posts**: by erecting goal posts and barriers, machines which have to pass beneath lines can be limited to a safe height - an option especially suited to gateways and tracks.

Working safely

Key elements of safe systems of work are:

Training

Everybody who works near overhead power lines with a machine or equipment needs to know what the dangers of overhead lines are and the precautions to follow.

Visitors

Contractors are at risk when they work on farms where overhead lines are present. Make sure they know where the lines are and tell them the precautions they need to take. Routes can be marked with safety signs to warn all visitors of the dangers.

Use of machinery

Accidents can be avoided if the following operations are **not** carried out within a horizontal distance of at least 9 m from power lines on wooden poles or at least 15 m of lines on metal towers:

- stacking bales or potato boxes;
- folding sprayer booms;
- tipping trailers or lorries;
- operating materials handlers;
- working on top of combines or other high machinery.

Risks can be reduced by:

- using sprayers with horizontally folding booms;
- taking care not to damage poles and stays;
- making sure machinery can operate safely near any overhead lines;
- fitting shorter radio aerials to high machines so they cannot cause danger;
- carrying irrigation pipes horizontally using two people and not storing pipes near power lines.

EMERGENCY ACTION IN THE EVENT OF AN ACCIDENT

- **Never touch an overhead line - even if it has been brought down by machinery, or has fallen. Never assume lines are dead.**
- **When a machine is in contact with an overhead line, electrocution is possible if anyone touches both the machine and the ground.**
- **If you need to get out to summon help or because of fire, jump out without touching any wires or the machine. Keep away.**
- **Get the electricity company to disconnect the supply. Even if the line appears dead, do not touch it - automatic switching may reconnect the power.**

Further advice

For further advice and information contact your local electricity supply company. You can also get advice from the Farm Energy Centre, National Agricultural Centre, Stoneleigh Park, Warwickshire CV8 2LS (Tel: 01203 696512). To obtain the latest edition of their handbook *Safe use of electricity in farming and horticulture* (FEC 2100: 3rd edition 1992), send them a cheque for £2.50 made payable to Farm Energy Centre.

Further reading

Avoidance of danger from overhead electrical lines GS 6 (rev) HSE Books 1991 ISBN 0 11 885668 5

Farm Electric *The safe use of irrigators and slurry guns near overhead electric power lines* Electricity Association Technology Ltd. Available free from the Farm Energy Centre, National Agricultural Centre, Stoneleigh Park, Warwickshire CV8 2LS

Memorandum of guidance on the Electricity at Work Regulations 1989 HSE Books 1989 ISBN 0 11 883963 2

Management of health and safety at work. Management of Health and Safety at Work Regulations 1992. Approved Code of Practice HSE Books 1992 ISBN 0 7176 0412 8

An HSE video called *Shock horror* is available for purchase or hire from CFL Vision, PO Box 35, Wetherby LS23 7EX (Tel: 01937 541010).

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS. Tel: 01787 881165 Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web: http://www.open.gov.uk/hse/hsehome.htm

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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Overview

STANDEN ZENO 2-row and 3-row tractor mounted planters are designed to plant potatoes with extreme gentleness and accuracy in either standard planting or bed work.

Tractor Suitability

The ZENO planter is suitable for CAT 2 and CAT 3 tractors of 75 Kw (100 bhp) minimum with open-centre, closed-centre or load-sensing hydraulic systems..

The tractor must be of a suitable size to lift the implement safely. This may entail the fitting of front weights to counterbalance the machine when in the raised position.

Attaching the Planter to the Tractor

Reverse the tractor up to the planter and engage the 3-point linkage lower arms on the bottom lift pins (item 1, fig 1). The arm stabilisers must be set to ensure the planter runs central to the tractor. Fit the top link in one of the holes (item 2, fig 1) and adjust to level the planter.

When fitting to the tractor ensure the planter is standing on firm level ground. The operator should have read and understood the tractor operators manual prior to attaching the machine and putting into work.

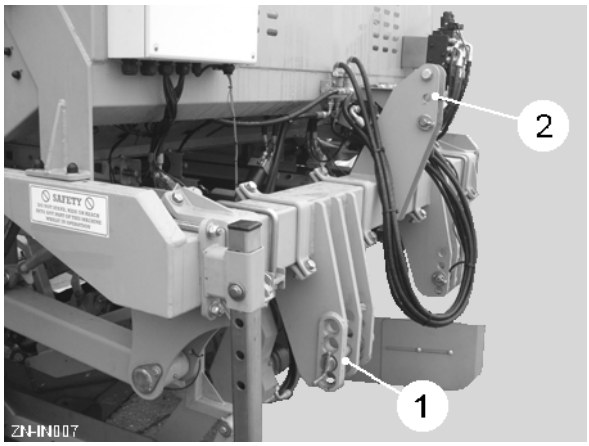


Fig 1

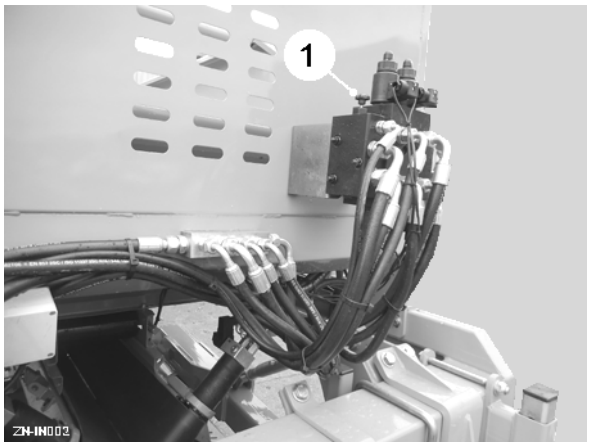


Fig 2

Set the planter valve bank to match the tractor hydraulic system. For closed-centre and load-sensing systems, turn the screw (item 1, fig 2) clockwise until fully in. For open-centre systems, turn the screw anti-clockwise until fully out.

Connect the hydraulic pressure hose (red) to the tractor constant supply port.
Connect the hydraulic return hose (blue) to the tractor return port.
Connect the ¼" load sensing hose (if required) to the tractor L/S outlet.

INSTALLATION 1.8

Mount the control console in a position where it is comfortable to operate when seated. An adjustable suction mount is fitted to attach the console to the side window of the tractor.

Care should be taken to ensure the control box does not obstruct driver visibility and access to the tractor controls.

Connect the control lead between the planter and control console by routing it through existing apertures in the tractor cab.

Ensure the plug and socket connections are clean and coupling pins undamaged before connection, and that they are securely locked together.

The control console requires a 12v D.C. supply. A ‘D’ plug is fitted to the power lead for connection to the tractor electrics. If the power becomes too low to operate the planter it may be necessary to connect the lead directly to the tractor battery, blue lead to negative (-) terminal and brown lead to positive (+) terminal.

Ensure the battery connections are made correctly to prevent damage to the control system.

Finally, connect the road lights plug to the tractor 7-pin socket.

Planting

Careful planting is one of the pre-requisites for a good crop of high quality potatoes. The potatoes should be planted in straight ridges without gaps and at a correct and even depth. This is achieved when, at the beginning of planting, the functions of the planter and the different adjustments are carefully studied.

The seed potatoes used can vary a great deal (i.e. different varieties, shape, size, number of sprouts, skin quality etc.) and the planter must be adjusted accordingly. See 'Calibrating the Control System'.

Depth Control

The seed planting depth is determined by the height of the openers (item 1, fig 3) relative to the land wheels (item 1, fig 4). The depth control can be either manual or hydraulic.

On machines with manual depth control, the depth is set by the top links (item 2, fig 4). Shortening the top links will lower the openers relative to the wheels thus increasing the planting depth. Always adjust both wheels equally.

On machines with hydraulic depth control the top link is replaced by a hydraulic ram actuated via the control console.

An automatic depth control sensor can also be fitted to ensure planting depth is maintained irrespective of the contours of the bed.

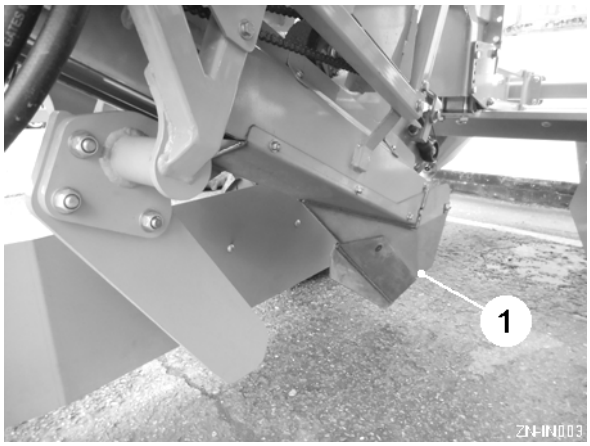


Fig 3

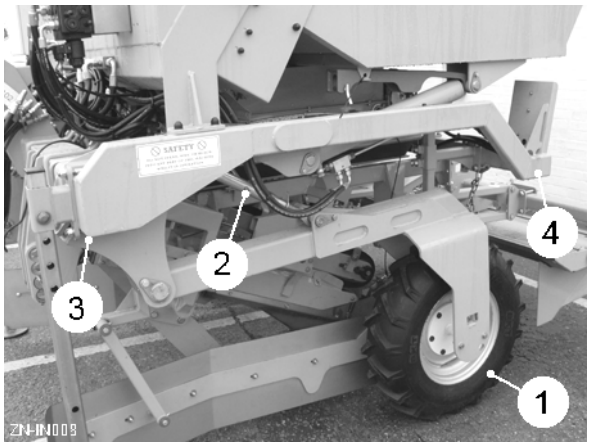


Fig 4

Land Wheels

The land wheels can be either fixed or steerable. A proximity sensor fitted to the RH wheel axle monitors the forward speed of the planter.

On machines with steerable wheels, a wheel indicator is fitted to assist the operator.

The land wheels must be set to straddle the rows.

The distance between the LH and RH wheels can be set between 68” (172cm) to 80” (203cm) on a 2-row machine, and between 72” (183cm) to 80” (203cm) on a 3-row machine.

To adjust the land wheels:

With the tractor and planter outfit on firm, level ground, raise the planter wheels clear of the ground and place supports under the front beam (item 3, fig 4) and rear beam (item 4, fig 4).

WARNING: Never work under the machine when raised on the tractor 3-point linkage. Always use additional supports.

Loosen the axle mounting clamps (item 1, fig 5) and slide the wheel unit out to the desired position symmetrical about the centre of the machine. Finally, retighten the clamps.

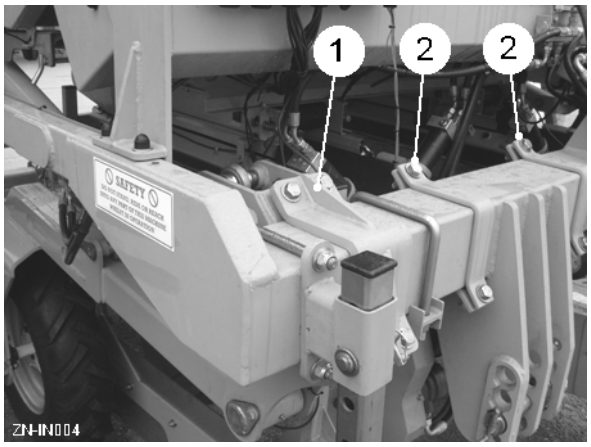


Fig 5

Row Centres

Row centres can be set between 30” (76cm) to 40” (102cm) on a 2-row machine, and between 16” (41cm) to 18” (46cm) on a 3-row machine.

WARNING: Always lock the raised hopper with the stays (item 2, fig 8) before working underneath (see tipping hopper).

To adjust row centres:

1. With the planter on firm, level ground, raise the planter on its land wheels until the openers (item 1, fig 3) are clear of the ground.

2. Place supports under the front and rear beams (item 3 & 4, fig 4) to stabilise the machine.

3. Fully raise the tipping hopper and fit the stays (item 2, fig 8).

4. Loosen the opener unit front clamps x2 (item 1, fig 6) and the rear clamp plate (item 2, fig 6).

5. Loosen the moulding board / ridger tool bar mounting brackets x2 (item 3, fig 6).

6. Loosen the hopper filler plate lug bolts x4 (item 1, fig 7), the slot bolts x4 (item 2, fig 7) and the mounting bolts x2 (item 3, fig 7).

7. Using mechanical assistance, slide the complete opener unit out to the desired position symmetrical about the centre of the machine.

8. Depending on row centres, it may be necessary to remove the filler plate mounting bolts (item 3, fig 7) and position them in a different hole in the hopper panels.

9. Repeat for the other opener unit.

10. Finally, retighten all clamps and bolts

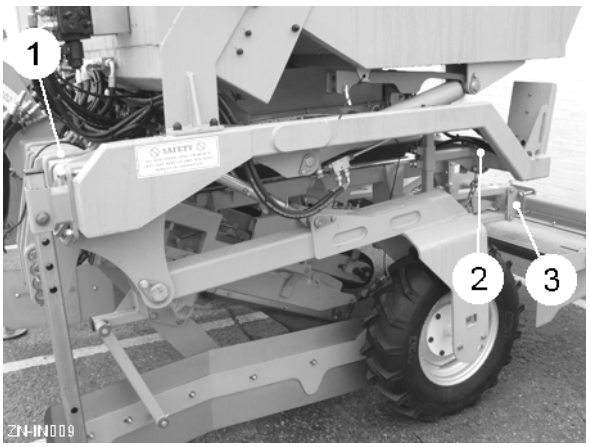


Fig 6

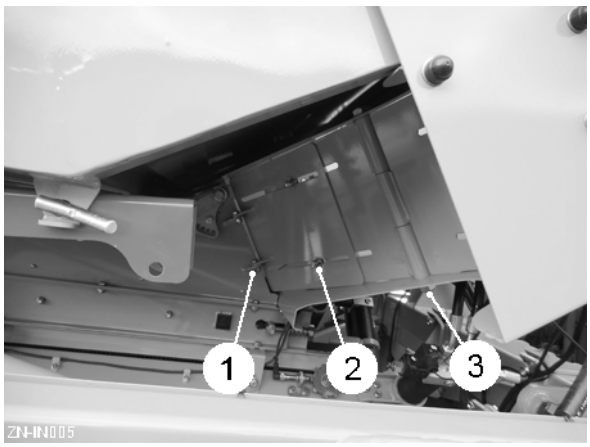


Fig 7

Tipping Hopper

The rear section of the tipping hopper (item 1, fig 8) is designed to gently feed the potatoes into the hopper belts. Sensors can be fitted inside the hopper to detect the level of seed above the hopper belt feed area. On automatic mode the sensors raise the rear section of the hopper automatically.

The stays (item 2, fig 8) are provided to lock the hydraulic rams (item 3, fig 8) in the open position when working under the hopper. The hopper should be empty when performing this operation.

WARNING: Always lock the raised hopper with the stays (item 2, fig 8) before working underneath.

To lock the hopper in the raised position:

1. Raise the hopper fully.

2. Remove the pin (item 4, fig 8) and lower the stay (item 2, fig 8) down over the piston rod (item 5, fig 8).

3. Insert the pin (item 4, fig 8) into the hole (marked A) fitting it under the piston rod and secure it with the 'R' clip.

Always unlock and reset the stays (item 2, fig 8) before lowering the hopper. Failure to observe this caution may cause serious damage to the machine.

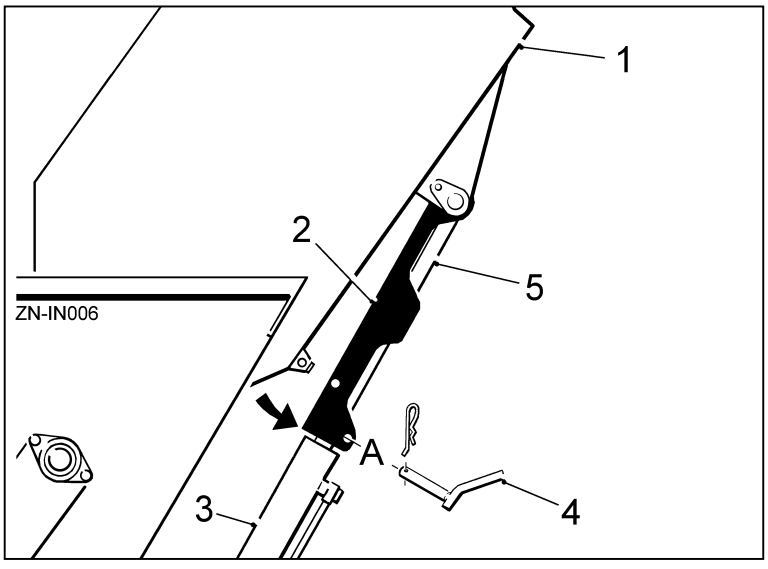


Fig 8

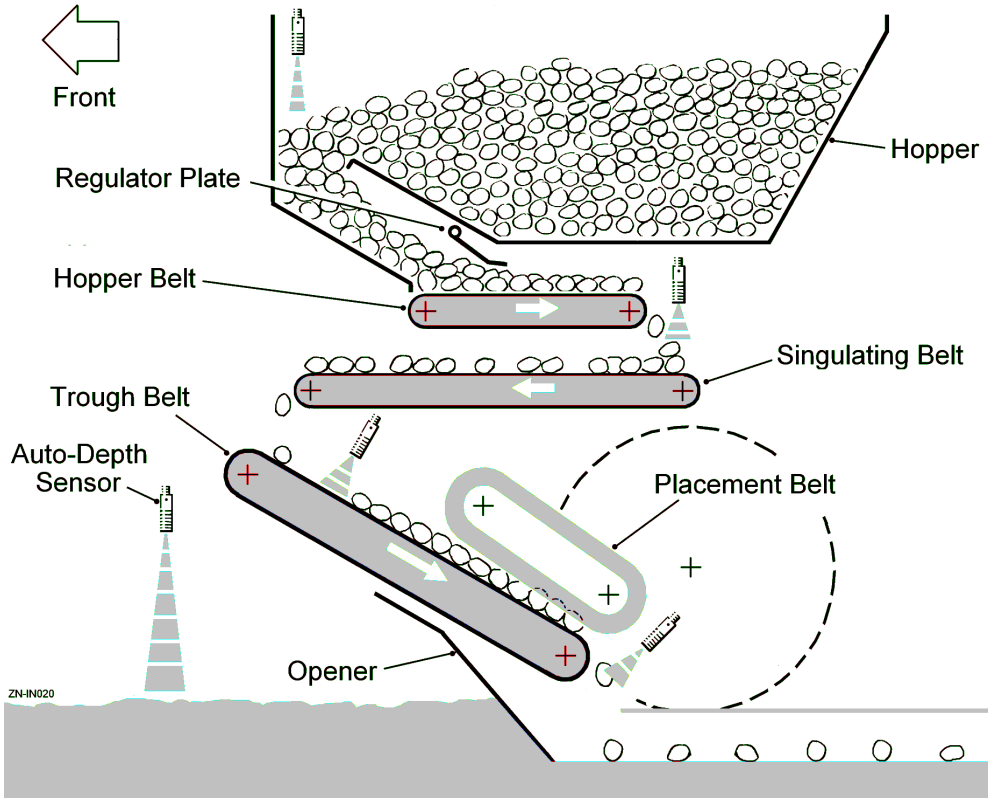


Fig 9

Hopper Belts

The hopper belt (item 1, fig 10) conveys the seed potatoes from the hopper to the singulating belts (item 2, fig 10). The regulator plate (item 1, fig 11) should be set to keep a single layer of seed covering the hopper belt. Lowering the regulator plate too much could result in 'bridging' and may cause a blockage. To adjust pull out the knob (item 2, fig 11) and relocate the knob plunger into a different slot in the index plate.

The sensor (item 3, fig 10), via the motor ON/OFF valve (item 4, fig 10), controls the amount of seed deposited onto the singulating belts (item 2, fig 10). The amount should be sufficient to create a continuous, single line of potatoes on the singulating belts. To achieve this, raise / lower the sensor arm (item 5, fig 10). Moving the sensor down closer to the singulating belts will cause the hopper belt to stop sooner thus reducing the seed quantity.

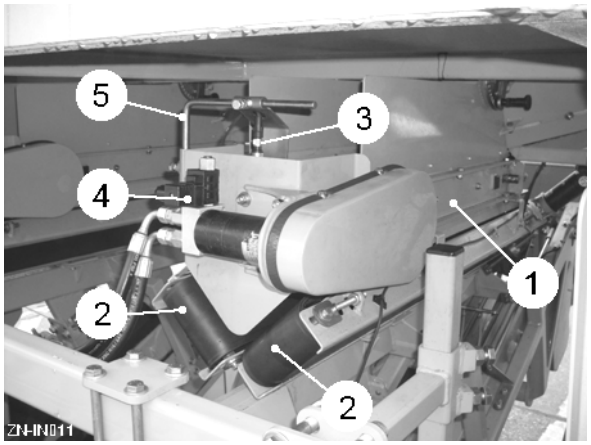


Fig 10

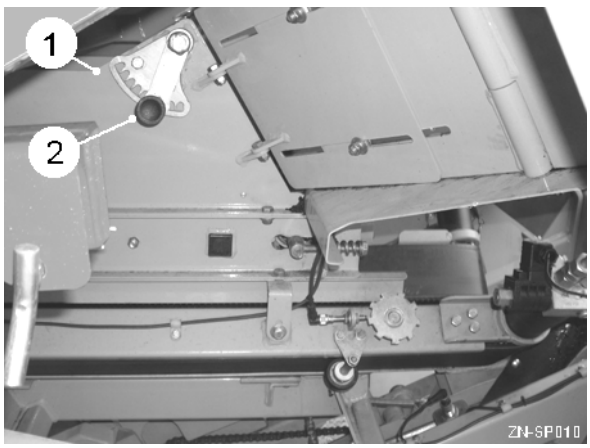


Fig 11

Singulating Belts

The singulating belts (item 2, fig 10) consist of one fast belt and one slow belt arranged in a V-format. The action of the fast and slow belts sorts the potatoes into a continuous, single line before feeding them onto the trough belt. The belts on the RH unit are each fitted with a proximity sensor (item 1, fig 12) which monitors their speed.

The sensor (item 2, fig 12), via the motor ON/OFF valves (item 3, fig 12), controls the flow of seed. A continuous, single line of potatoes should be presented to the trough belt. To achieve this the sensor can be adjusted for position and range.

To adjust the position, loosen the clamp bolt and slide the sensor along the support bar (item 4, fig 12). The sensor should be positioned to allow a row of seed to build up in front of the seed placement belt.

The rubber curtain (item 5, fig 12) is designed to restrict the flow of singulated seed to the trough belt. The curtain is raised / lowered by loosening the locking knob (item 6, fig 12) and rotating the curtain mounting. Do not restrict the flow too much as this can result in misses when planting.

Trough Belt

The trough belt (item 1, fig 13) and seed placement belt (item 2, fig 13) work together to deliver the row of seed potatoes to the openers. The sensor (item 7, fig 12) monitors the speed of the belts which, along with the forward speed of the planter, ensures even spacing of the seed in the ground.

The sides of the trough belt are angled upwards by the extension panels (item 3, fig 13) creating a trough that keeps the potatoes centred. The panels are adjustable to create different width troughs depending on seed size and should be set to prevent one potato overtaking another which could result in ‘doubles’. To adjust, loosen the bolts x3 (item 4, fig 13) and slide the extension panels to the required position.

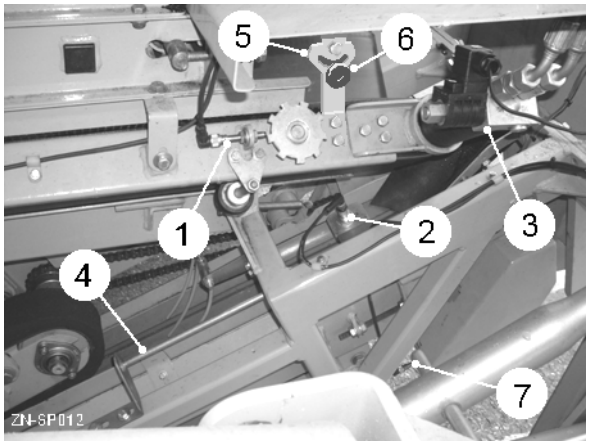


Fig 12

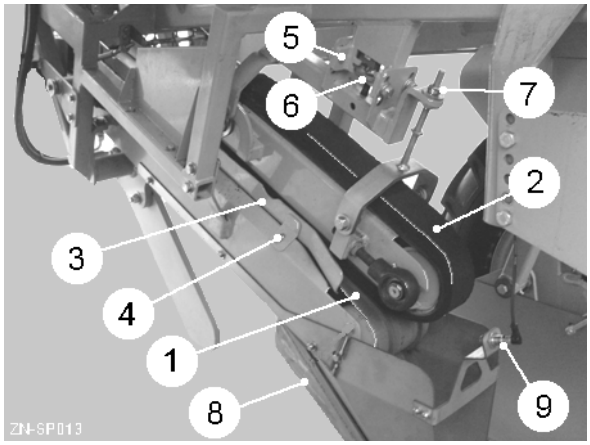


Fig 13

Seed Placement Belt

The height and angle of the seed placement belt (item 2, fig 13) relative to the trough belt (item 1, fig 13) should be set to allow the pintle fingers to grip the seed. If set too low, the belt may crush the seed. Conversely, setting the belt too high will allow the seed to roll out without any control.

To adjust the height of the placement belt, loosen the mounting bolts x4 (item 5, fig 13) and turn the adjuster nut (item 6, fig 13) clockwise to raise unit or anti-clockwise to lower the unit.

The throat angle should be set to give the potatoes a lead-in. An angle of approximately 5° relative to the trough belt is usually sufficient. To adjust the angle, turn the locknuts (item 7, fig 13).

Openers

The stainless steel openers (item 8, fig 13) produce a furrow in the bed ready to accept the seed. The height of the front wear point is adjustable to produce a deeper furrow. The sensor (item 9, fig 13) detects the potatoes as they fall into the opener.

Soil Retention Panels

The soil retention panels (item 1, fig 14) prevent soil flowing from the openers into the wheelings.

To adjust, loosen the front support clamp (item 2, fig 14) and the rear support clamp plate (item 3, fig 14) and move the retention panel unit in or out to the desired position. To improve the soil flow it may be necessary to adjust the panels so that they sit at an angle to the openers, with a larger gap at the rear.

During work the panels (item 1, fig 14) should be horizontal and the pivot arms (item 4, fig 14) approximately 30° from horizontal enabling the panels to rise and fall when following the ground contours. To adjust, loosen the front leg clamp (item 5, fig 14) and rear leg clamp (item 6, fig 14) and raise / lower the unit until the correct angle is achieved. The stop bracket (item 7, fig 14) supports the retention panel when lifting the planter out of work. To adjust the height, reposition the locking bolt (item 8, fig 14) into a different hole in the plate.

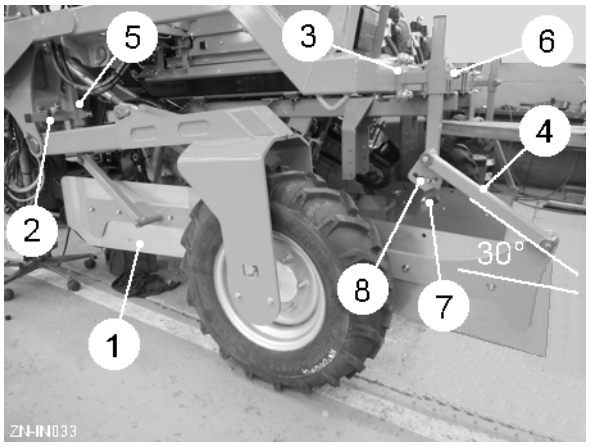


Fig 14

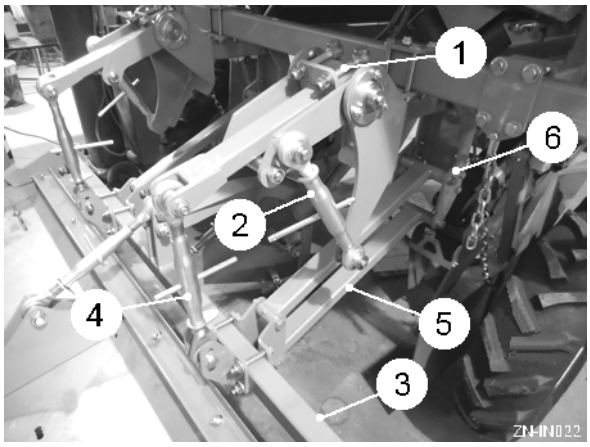


Fig 15

Bed Shaper Control Linkage

The bed shaper can be either an adjustable moulding board or ridgers. The torsion springs (item 1, fig 15) control the effect the moulding board / ridgers have when preparing the finished bed / ridge. When fitted with a moulding board, the torsion springs exert pressure on the bed. When fitted with ridgers, the springs act as an adjustable tension spring.

To adjust the pressure / tension exerted by the torsion springs, adjust the top links (item 2, fig 15). Shortening the top links will exert more downward pressure on the tool bar. Conversely, lengthening the links will carry weight off the tool bar. Ensure both sides are adjusted equally.

The height at which the tool bar (item 3, fig 15) operates is set by the top links (item 4, fig 15). During work the parallel arms (item 5, fig 15) should be at approximately 10° to the horizontal. Additional height adjustment is provided by the holes in the mounting plates (item 6, fig 15).

Ridger Bodies (optional)

The ridger bodies (item 1, fig 16) create the sides of the bed. The ridgers are positioned by loosening the retaining bolts (item 2, fig 16) and sliding the units along the tool bar. The height of each ridger is adjusted by loosening the clamp bolts (item 3, fig 16) and then raising or lowering the unit. The pitch of the ridger bodies can be altered in the same way. To adjust, loosen one bolt and then tighten the other. Which bolt to tighten and which to loosen depends on the required direction of tilt.

The wings (item 4, fig 16) are adjustable to provide additional control of the soil flow. To adjust, loosen the retaining bolt (item 5, fig 16) and pull the wings out equally.

Each ridger body is protected by a shear bolt (item 7, fig 16). If the ridger hits an obstruction the bolt will break allowing the ridger to swing backwards preventing serious damage to the machine.

If a shear bolt breaks, stop, lift the machine out of work and check for damage. Reset the ridger and replace the shear bolt. Shear bolts should be kept tight at all times.

2-Row Front Ridger

The centrally mounted front ridger moves soil from the centre of the bed to the outsides giving more soil for the openers to work with. Adjustments are the same as above.

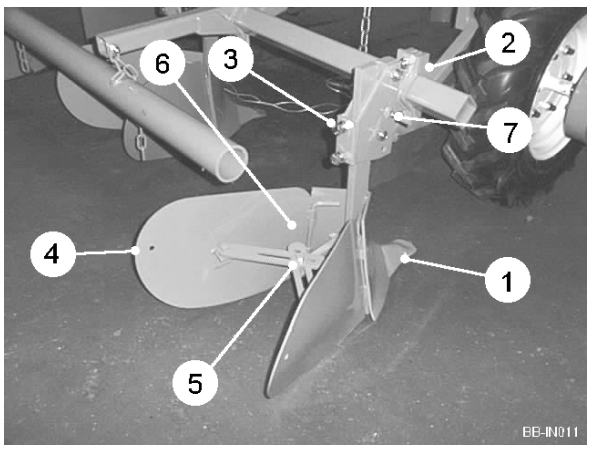


Fig 16

Bed forming board

Fig 17

Bed Forming Board (optional)

The bed forming board (item 1, fig 17) operates between two ridger bodies. The board creates a flat top on the finished bed. The board extensions (item 2, fig 17) are adjusted in conjunction with the ridger bodies. The position of the ridgers is important to ensure a nicely formed bed. Leaving too much gap between the ridgers and the board extensions will cause a ridge to be formed on top of the finished bed.

The weight (item 3, figure 17) flattens the bed. By adding extra weights the bed can be flattened further. The chains (item 4, fig 17) should be set to allow the board to float when in work and also to support the board when the planter is raised. To adjust, reposition the shackle (item 5, fig 17).

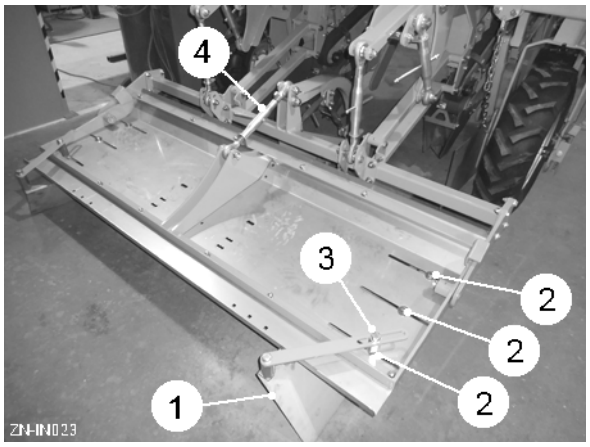


Fig 18

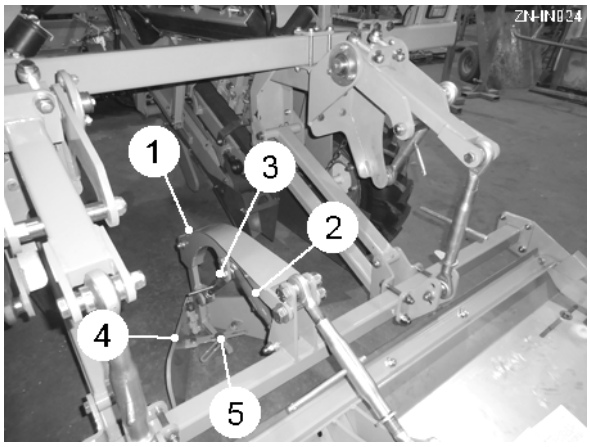


Fig 19

Multi-Adjustable Moulding Board (optional)

The multi-adjustable moulding board can be set up for planting rows or beds. The position of the wings (item 1, fig 18) is important to ensure a nicely formed bed.

The outer wings are adjustable for width by loosening the mounting bolts x3 (item 2, fig 18). To adjust the angle of the wing, loosen the retaining screw (item 3, fig 18) and pull the wing out. Adjust both sides equally. The angle of the centre wings (if fitted) are adjustable in the same way.

The top link (item 4, fig 18) sets the angle of the moulding board. Initially, the board should be pitched up at approximately 5° at the front. Lengthening the top link will increase the angle allowing more soil under the board whilst simultaneously holding the soil and compressing it.

The centre plough (item 1, fig 19) controls the amount of soil pushed sideways under the moulding board giving, if required, more soil to the edge of the bed. The height of the plough is set by the top link (item 2, fig 19). The deeper the plough is set, the more soil it will push sideways. Care should be taken as going too deep may move the seed in the bed. The pitch angle of the plough is set by the top link (item 3, fig 19). To adjust the angle of the wings (item 4, fig 19), loosen the retaining bolt (item 5, fig 19) and pull the wings out. Adjust both sides equally.

Control System

The control console consists of the Z-PAD touch screen (item 1, fig 20) and various manual switches.

POWER ON/OFF (item 2, fig 20).
Turns the control system ON and OFF.

STEERING LEFT / RIGHT (item 3, fig 20).
Steers the planter wheels left / right.

HOPPER RAISE / LOWER (item 4, fig 20).
Raises / lowers the rear section of the tipping hopper.

HOPPER AUTO (item 5, fig 20).
Activates the automatic raise / lower function to feed the seed to the hopper belts.

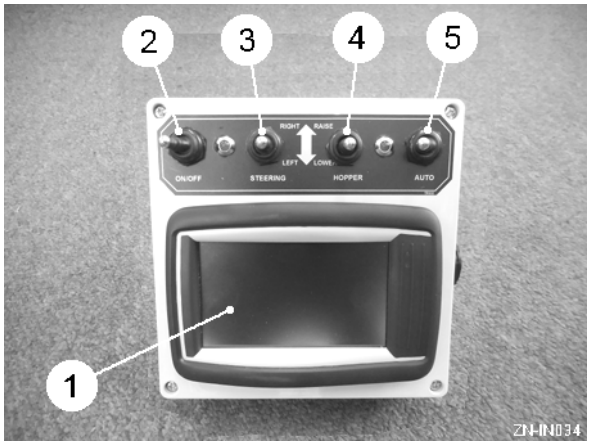


Fig 20

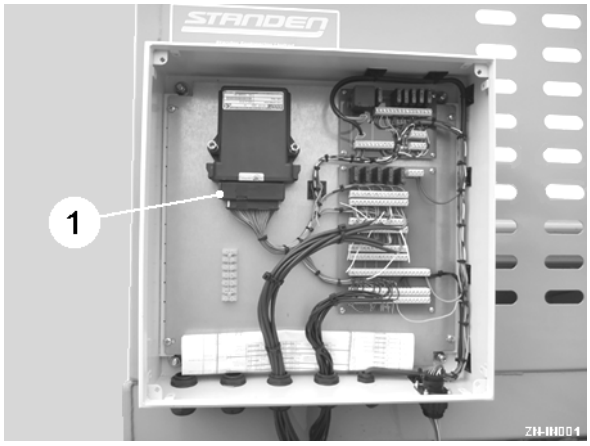


Fig 21

Always turn the control system OFF before transporting the planter on the road.

Do not leave or store the control consoles outside in the open and always disconnect the control box from the tractor electrical supply when not in use, so avoiding the possibility of draining the battery.

WELDING WARNING:
Before carrying out any welding on the planter, always disconnect the plugs (item 1, fig 21). Failure to observe the above precaution may result in severe damage to the planter control system.

Setting Up The Control System

Turn the control system ON. When fully powered up, the 'home' screen will display (see fig 35).

To ensure the calculations for seed spacing and seed coverage are correct, the following information must be set.

1. Press the icon  once.

2. **Imperial or Metric Units**
   Select either Imperial or Metric (see fig 37).

3. **Number Of Active Rows**
   Using the yellow arrows, scroll until the 'active rows' screen is displayed (see fig 40). Turn rows ON / OFF using the + and – icons. If only 1 row is selected, the RH row will be active. On a 3-row planter, selecting 2 rows will turn the centre row OFF.

4. **Centre Row Reduction (3-row only)**
   Using the yellow arrows, scroll until the 'centre row reduction' screen is displayed (see fig 41). Using the + and – icons select the percentage reduction. Alternatively, press the digits to display a keypad.

5. Press the icon  for 3 seconds.

6. **Wheel Circumference**
   The 'wheel circumference' screen is displayed (see fig 44). This setting is factory set. If the wheels are changed this figure will need to be reset. With the planter wheels on the ground, mark the sidewall of the tyre at the bottom and continue the mark onto the ground. Drive forward for one revolution of the wheel and mark the ground again. Measure the distance between the two marks. Record circumference using the + and – icons.

7. **Wheel Setting**
   Using the yellow arrows, scroll until the 'wheelings' screen is displayed (see fig 45). Record the wheel setting using the + and – icons. Alternatively, press the digits to display a keypad.

8. **Row Configuration**
   Using the yellow arrows, scroll until the 'row configuration' screen is displayed (see fig 50). Using the + and – icons, select the number of openers fitted to your planter.

9. **Seed Spacing**
   Press the icon  The 'seed spacing' screen will display (see fig 36). Select the desired seed spacing using the + and – icons. The number of sets per hectare / acre updates automatically. Alternatively, press the digits to display a keypad.

10. Press  to return to the 'home' screen.

Calibrating The Control System

To ensure the seed is planted at the correct spacing the control system will need to be calibrated. The system should always be re-calibrated when changing seed size.

To calibrate the system:

1. Press the icon 

. The ‘constant’ screen is displayed (see fig 51).

2. Using the + and – icons set the constant to 4.0.

3. Set the planter into work and measure the distance between 11 seeds.

4. Divide the distance by 10 and compare the result with the desired seed spacing.

5. If the spacing is too small decrease the ‘constant’. If the spacing is too large increase the ‘constant’. Always adjust in small steps e.g. 0.1.

6. Repeat the procedure until the correct seed spacing is achieved.

Manual Hydraulic Depth Control (optional)

On the 'home' screen (see fig 35) press the UP and DOWN arrows to hydraulically change the seed planting depth. To plant shallower press the UP arrow. To plant deeper press the DOWN arrow.

Automatic Hydraulic Depth Control (optional)

Automatic depth control ensures the preset planting depth is maintained irrespective of the contours of the bed. The control system will need to be told that a depth sensor is fitted.

Press the icon  for 3 seconds. Using the yellow arrows, scroll until the 'depth sensor fitted' screen is displayed (see fig 47). Record YES or NO using the + and – icons.

Press  to return to the 'home' screen (see fig 35). Using the + and – icons set the desired depth. Alternatively, press the digits to display a keypad and enter the depth. Press 'DONE' to confirm input. Press the 'auto-depth ON / OFF' icon to activate the system. The automatic depth control can be overridden momentarily by pressing the UP and DOWN arrows.

The depth control can be adjusted to set the amount of time (delay) before the depth rams actuate. This helps to smooth out surface irregularities enabling the planter to gradually change depth according to changes in bed height.

To adjust the delay, press the icon  once and, using the yellow arrows, scroll until the 'depth control delay' screen is displayed (see fig 39). Initially set the delay to 2.0 seconds.

A dead-band zone should be set to allow some movement up and down before activating the depth rams.

To adjust the dead-band, press the icon  for 3 seconds. Using the yellow arrows, scroll until the 'depth control dead-band' screen is displayed (see fig 49). Using the + and – icons, initially set the dead-band to 1.5cm.

Hopper Belt Speed and Delay

The hopper belts should move slowly, just enough to keep the singulating belts supplied with a manageable quantity of seed. Achieving the correct speed and flow is a matter of trial and error.

Press the icon 

. Using the yellow arrows, scroll until the 'hopper belt speed' screen is displayed (see fig 52). Increase / decrease the speed using the + and – icons. Alternatively, press the digits to display a keypad. Always start slowly and very gradually increase the speed.

The STOP delay is determined by the movement of the seed on the singulating belts. The delay should normally be set at 0.5 seconds but can be adjusted as follows.

Press the icon 

. Using the yellow arrows, scroll until the 'hopper stop delay' screen is displayed (see fig 57). Increase / decrease the delay using the + and – icons.

Singulating Belt Speed and Delay

The singulating belt units consist of a fast belt and a slow belt arranged in a V-format. The speed of the belts is controlled by the speed of the trough belt below (i.e. when the trough belt speeds up or slows down so do the singulating belts).

The speed ratio between the trough belt and the singulating belts is adjusted as follows.

Press the icon 

. Using the yellow arrows, scroll until the 'singulation fast belt ratio' screen is displayed (see fig 53). Press the digits to display a keypad (for fine adjustment use the + and – icons). Initially, set the ratio to 1.00 (i.e. 100%). This will set the fast belt speed to be the same as the trough belt speed. Gradually increase the speed just enough to keep the trough belt supplied with seed.

The speed of the slow belt is proportional to the speed of the fast belt (i.e. when the fast belt speeds up or slows down so does the slow belt). The action of the fast and slow belt sorts the potatoes into a continuous, single line. To achieve this the ratio between the fast and slow belt is adjusted as follows.

Press the icon 

. Using the yellow arrows, scroll until the 'singulation slow belt ratio' screen is displayed (see fig 54). Press the digits to display a keypad (for fine adjustment use the + and – icons). Initially set the ratio to 0.50 (i.e. 50%). This will set the slow belt to run at half the speed of the fast belt. If necessary, adjust the ratio to correctly singulate the potatoes.

The singulating belt units have an adjustable START and STOP delay. The START delay should normally be set at 0.1 seconds giving a minimal delay.

Press the icon 

. Using the yellow arrows, scroll until the 'singulation start delay' screen is displayed (see fig 55). Increase / decrease the delay using the + and – icons.

The STOP delay is determined by the movement of the seed on the trough belt. The delay should normally be set at 0.5 seconds. However, rounder seed will tend to roll, filling the trough belt quicker, requiring the singulating belts to stop sooner.

Press the icon 

. Using the yellow arrows, scroll until the 'singulation stop delay' screen is displayed (see fig 56). Increase / decrease the delay using the + and – icons. Alternatively, press the digits to display a keypad.

Trough Belt And Seed Placement Belt Speed

The trough belt and placement belt motors are hydraulically linked to operate at the same speed. The speed of the belts is determined by the seed spacing selected on the Z-PAD and the forward speed of the planter.

Seed Warning Delay

In normal conditions the seed monitors on the Z-PAD will flash indicating potatoes passing the sensors (item 9, fig 13) dropping into the furrow. If there is a blockage the seed monitor for that row will remain illuminated and a buzzer will sound. If the buzzer sounds too frequently without a blockage occurring the delay can be adjusted.

Press the icon  once. Using the yellow arrows, scroll until the 'seed warning delay' screen is displayed (see fig 42). Increase / decrease the delay using the + and – icons.

Screen Brightness

Press the icon  once. Using the yellow arrows, scroll until the 'screen brightness' screen is displayed (see fig 43). Increase / decrease the brightness using the + and – icons. Alternatively, press the digits to display a keypad.

Statistics

Press the icon  . The statistics screen will display (see fig 59). The screen displays information on the output of the planter during its lifetime, season and day. Season and day figures can be reset to zero if required.

Press the icon  once and, using the yellow arrows, scroll until the 'reset season / reset day' screen is displayed (see fig 38). Press to reset.

Diagnostics

Press the icon  . The 'diagnostics' screen will display (see fig 58). Use the arrows to scroll through the various diagnostics pages.

Press the icon  . The 'valve value' screen will display. The information contained in these screens is helpful to Standen's service department when diagnosing a problem.

Converting from 3-Rows to 2-Rows

The 3-row planter can be converted to 2-row by deactivating the centre row.

1. Remove the centre opener and the opener leg.

2. Fit the centre row cover plates as shown in the parts book (see page 3.5).

3. Fit the correct combination of moulding board / ridgers.

4. Press the icon  once. Using the yellow arrows, scroll until the 'active rows' screen is displayed (see fig 40). Set to 2-rows.

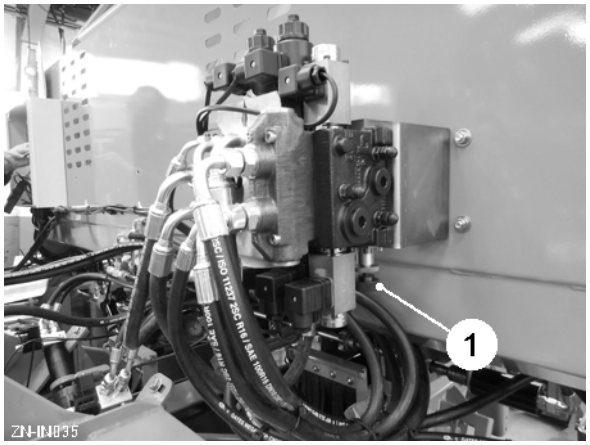


Fig 22

Hydraulic Ram Speed Adjustment

The speed at which the hydraulic ram functions such as tipping hopper, steering and depth control operate, can be set by adjusting the flow control knob (item 1, fig 22) under the relevant valve section.

Calibrating The Hydraulic Valves

The load placed on the various hydraulic motors determines how the belts run. If a belt fails to start, the valve powering the motor may need to be re-calibrated.

Press the icon  for 3 seconds. Using the yellow arrows, scroll until the 'calibrate valves' screen is displayed (see fig 48). Press to select and follow the on-screen instructions.

Belt Tension

The belts should be tensioned just enough to keep them driving under load. Do not over-tighten the belts as this will cause premature wear. Always adjust both sides of the belt equally,

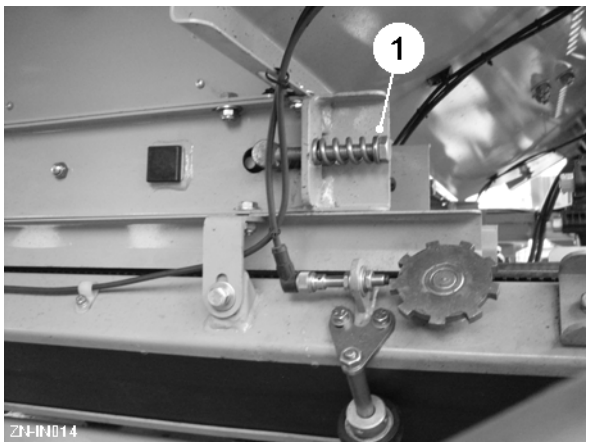


Fig 23

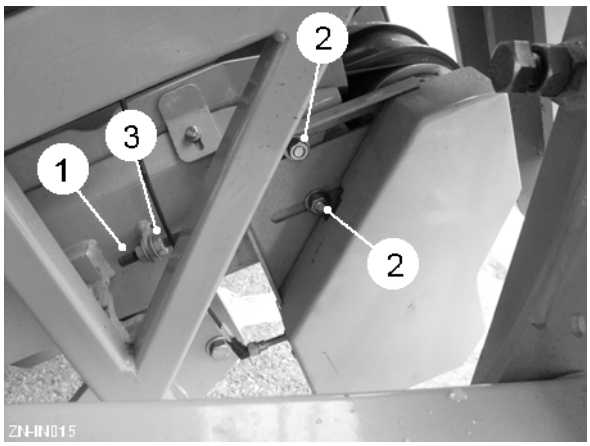


Fig 24

The hopper belt and singulating belt tensioners are spring-loaded. To tension the belts, turn the spring adjuster bolt (item 1, fig 23) clockwise to increase the tension, or anti-clockwise to decrease the tension.

The trough belts are tensioned by the setscrews (item 1, fig 24). To adjust, loosen the roller plate mounting bolts (item 2, fig 24) and reposition the locknuts (item 3, fig 24).

The placement belts are tensioned by the threaded rods (item 1, fig 25). To adjust, reposition the locknuts (item 2, fig 25).

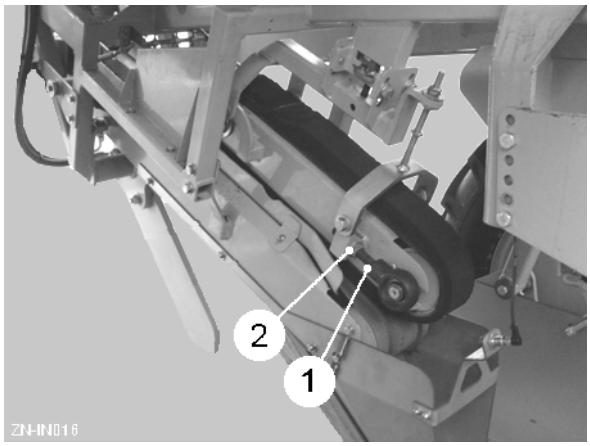


Fig 25

Drive Chain Tension

The drive chains should be tensioned to give a positive drive without undue stretching.

To tension the hopper belt drive chain (item 1, fig 26) reposition the nylon tensioner (item 2, fig 26). The tensioner will initially show fairly rapid wear but will settle down when the chain rollers rather than the chain side plates come into contact with the plastic.

To tension the trough belt drive chain (item 1, fig 27), loosen the motor mounting bolts x2 (item 2, fig 27) and rotate the motor around the rear mounting bolt. It may be necessary to adjust the proximity sensor (see sensor adjustment).

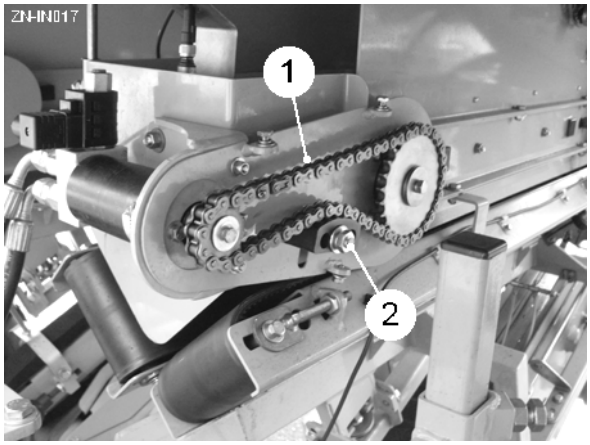


Fig 26

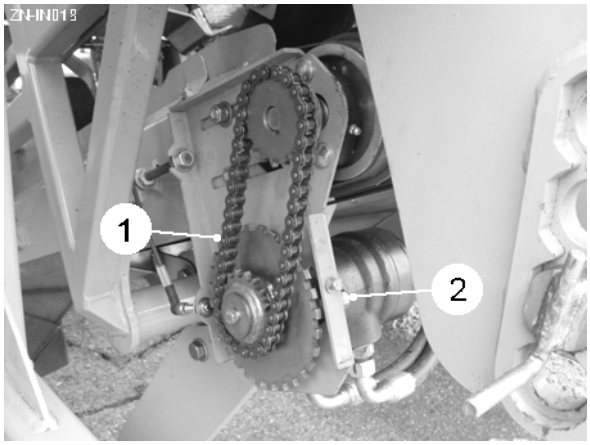


Fig 27

Sensor Adjustment

Inductive proximity sensors are used to monitor the speed of the RH wheel, the RH unit singulating belts and the RH trough belt. The LED on the side of the sensor should flash when the toothed monitor wheel rotates under it. A 1mm gap should exist between the sensor face and the monitor wheel. If necessary, adjust the position of the sensor to achieve this.

Photo-electric and ultra-sonic sensors are fitted to the hopper belts, trough belts and openers. The reaction distance of each sensor is preset at the factory. Minor adjustments to the sensing distance can be made by turning the screw located on the side of the sensor body. The sensing distance is increased by turning the screw clockwise and decreased by turning it anti-clockwise. The LED on the side of the sensor will illuminate when the sensor detects an object. Ensure the sensor is set to detect the seed and not the belt.

Electrical System Maintenance

The components within the electrical system are designed to be maintenance free. If it becomes necessary to carry out any repair, only a competent engineer capable of this type of work should carry out the repair. Periodically ensure that all multi pin plugs are correctly fitted into their sockets and are not becoming loose.

Hydraulic System Maintenance

The components within the hydraulic circuit are designed, on the whole, to be maintenance free. If it becomes necessary to carry out any repair, the work should be carried out by a competent engineer capable of this type of work.

Hydraulic oil under pressure is dangerous. Ensure that any residual pressure is released safely before working on the system. Do not release ram hoses without first supporting the part of the machine the ram controls.

Cleanliness is of paramount importance. Before dismantling any part of the hydraulic system, ensure the surrounding area is clean. If necessary, power wash the area to be worked on. Dirt must be prevented from entering the system, so any orifices left open, such as pipe ends or ports of motors must be blanked off with a suitable plug. Do not use cloth or rag, as the lint from these can contaminate.

As the tractor supplies the oil for the machine's hydraulics, ensure that the tractor hydraulic system is serviced in accordance with the manufacturer's recommendations to prevent any contamination of the machine's system. To extend the life of the hydraulic components it is important to monitor the condition of the hydraulic oil. Always maintain adequate oil level in the tractor's reservoir.

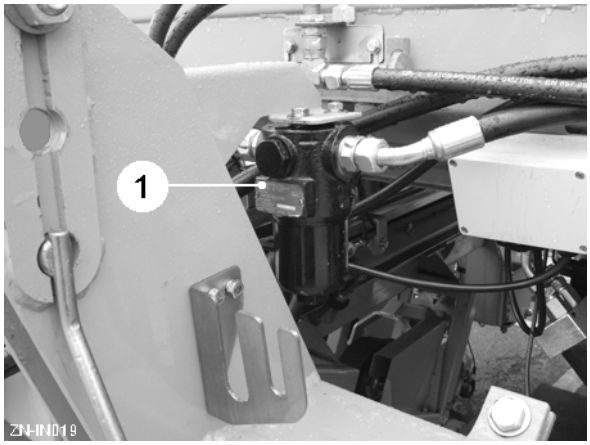


Fig 28

The pressure filter element (item 1, fig 28) should be replaced after the first 50 hours running time and then every 500 hours or annually thereafter.

To replace the filter element:

1. Lower the planter to the ground. Switch off the tractor engine, apply the handbrake and remove the ignition key.

2. Operate the spool valve feeding the planter to release any residual pressure and then disconnect the feed hose from the tractor.

3. Unscrew the bottom casing using the spanner spigot.

4. Remove the filter element and rinse out the casing. Check the seal and renew if necessary.

5. Fit the new element and refit the casing ensuring that it is tight.

6. Run the system and check for leaks.

Lubrication

Regular lubrication is an integral part of looking after your machine. The schedule of maintenance outlined below is a guide to when certain actions should be carried out. If your machine requires a more frequent lubrication schedule because of your workload, then it is advisable to reduce the time intervals.

Shafts, bearings and pivot points fitted with grease nipples should be greased with good quality medium grease. Do not allow these points to run dry, as this will accelerate wear

When greasing bearings some are sealed and pre-lubricated. You should take care not to over-grease this type as the seals may be damaged. If the seals become damaged it may be possible for dirt to enter the bearing causing accelerated wear.

A suitable chain lubricant or a smear of grease should be regularly applied to drive chains to prevent wear.

Use only the BP lubricants recommended by Standen or an exact equivalent recommended by your lubricant supplier.

Medium grease = BP Energrease L S E P 2

Daily Maintenance

During the working season the following daily maintenance should be carried out. Check all covers and guards are in position, free from damage. Repair or replace any found to be defective before operating the machine.

Carry out the following checklist: -

1. Check tension of all drive chains, adjust if necessary and lubricate with clean oil.

2. Check tyre pressures and adjust if necessary.

3. Check wheel nuts for tightness.

4. Check all hydraulic cylinders, valves and pipe work for signs of leaks or damage, repair or replace as necessary.

5. Carry out lubrication

Weekly Maintenance

During the working season the following weekly maintenance should be carried out.

1. Carry out all the procedures listed in daily maintenance.

2. Check all shafts, bearings for undue wear and replace as necessary.

3. Check all bearings for lubrication, grease as necessary.

4. Check openers, soil retention panels, ridgers / moulding boards etc. for excessive wear, replace if necessary.

Annual Maintenance

Prior to the start of the working season the following maintenance should be carried out.

1. Carry out all the procedures listed in daily and weekly maintenance.

2. Check feed belts and cup belts for any damage or wear and repair or replace as necessary.

3. Check metalwork for any damage or wear and repair or replace as necessary.

4. Inspect wheel bearings and check for excessive wear, replace as necessary.

5. Replace the pressure filter element. Use only genuine Standen replacement parts. **THESE ARE NOT WASHABLE ELEMENTS.**

Out of Season Storage

The machine can frequently operate in soils which contain chemical fertilisers etc. When the working season is completed wash and clean the machine thoroughly prior to carrying out the following checks and operations.

1. Apply oil, grease or an anti rust agent on any exposed bright metal surfaces which have been polished by the soil flow.

2. Clean all drive chains and lubricate.

3. After carrying out the hydraulic residual pressure dump procedure, any parts of hydraulic cylinders rods that are still exposed should be greased or oiled to prevent corrosion.

4. Ensure that the tyres are inflated to the correct pressure.

5. Ensure that the hydraulic hose quick release couplings and the electrical connectors on the machine are kept clean and dry.

6. Check the whole machine carefully and note any repairs that may need to be carried out. It is always better to carry out any repairs well before the commencement of the following season.

7. Carry out all the lubrication checks outlined in routine maintenance.

8. Ensure the control consoles are kept in a safe, dry place and available for use at the commencement of work or for any maintenance to be carried out.

6. Ensure that this handbook is kept in a safe place and available for use at the commencement of work or for any maintenance to be carried out.

SPECIFICATIONS 1.32

Machine Dimensions

Length (ZENO 21)	3.40m
Length (ZENO 31)	3.72m
Width	2.31m
Height (hopper raised)	3.44m
Height (hopper lowered)	2.45m

Machine Weight

ZENO 21	1680 kg
ZENO 31	2215 kg

Technical Data

Wheelings (ZENO 21)	172 cm (68”) to 203 cm (80”)
Wheelings (ZENO 31)	183 cm (72”) to 203 cm (80”)
Row centres (ZENO 21)	76 cm (30”) to 102 cm (40”)
Row centres (ZENO 31)	41 cm (16”) to 46 cm (18”)
Hopper capacity	1250 kg
Tractor power requirement	75 Kw (100 bhp) minimum
Oil flow requirement	13.5 ltr/min (3 gal) minimum
Tyre size	7.5x16 7.5x20
Tyre pressure	3.5 Bar (50 psi) maximum

Nut/bolt Torque

Description	Torque		Description	Torque
M6 nyloc zinc nut	10 lb/ft		M6 bolt/steel nut	7 lb/ft
M8 nyloc zinc nut	23 lb/ft		M8 bolt/steel nut	19 lb/ft
M10 nyloc zinc nut	44 lb/ft		M10 bolt/steel nut	38 lb/ft
M12 nyloc zinc nut	87 lb/ft		M12 bolt/steel nut	70 lb/ft
M16 nyloc zinc nut	208 lb/ft		M16 bolt/steel nut	170 lb/ft
M20 nyloc zinc nut	380 lb/ft		M20 bolt/steel nut	325 lb/ft
M24 nyloc zinc nut	690 lb/ft		M24 bolt/steel nut	565 lb/ft

Home Screen

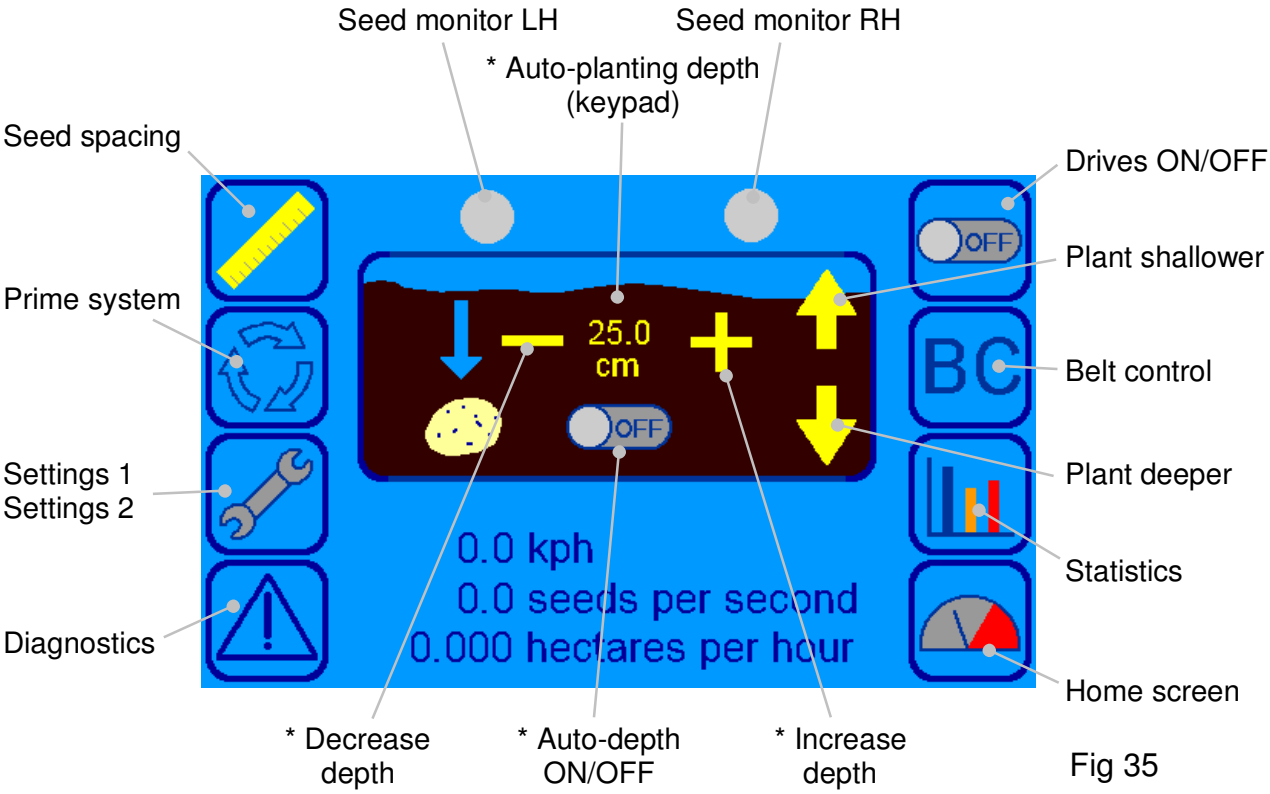


Fig 35

Note: Icons marked * displayed only when 'depth sensor fitted' screen is active.

Seed Spacing Screen

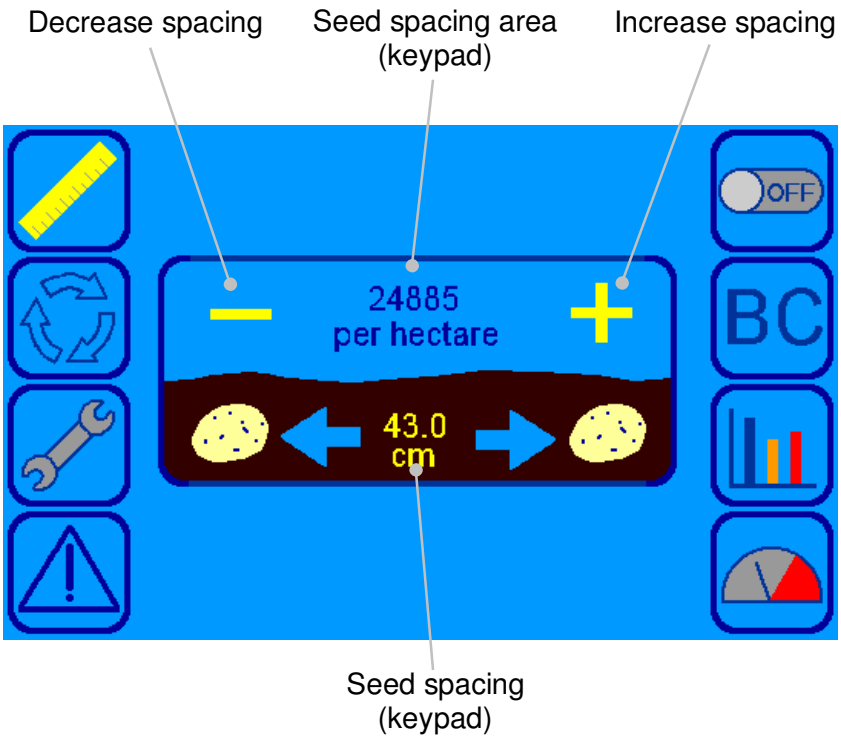


Fig 36

Settings 1 (press once)

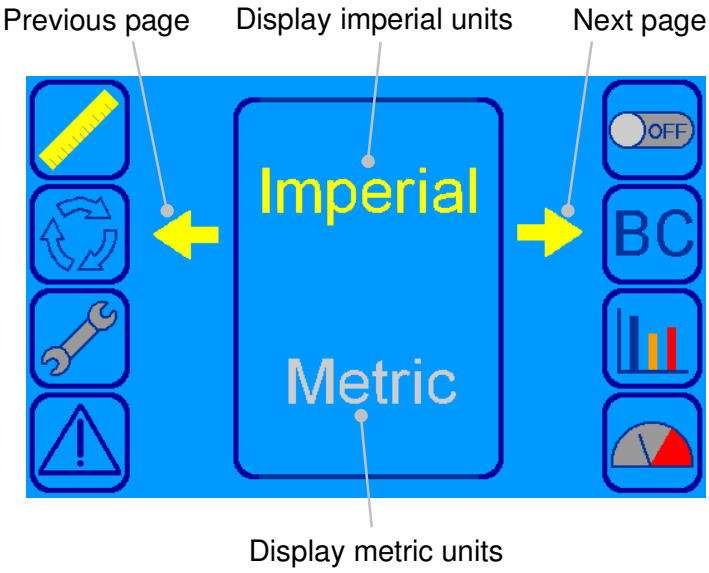


Fig 37

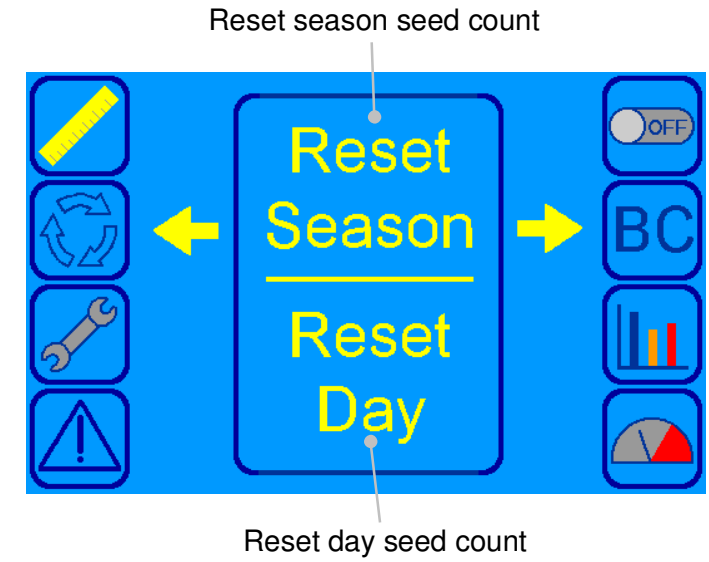


Fig 38

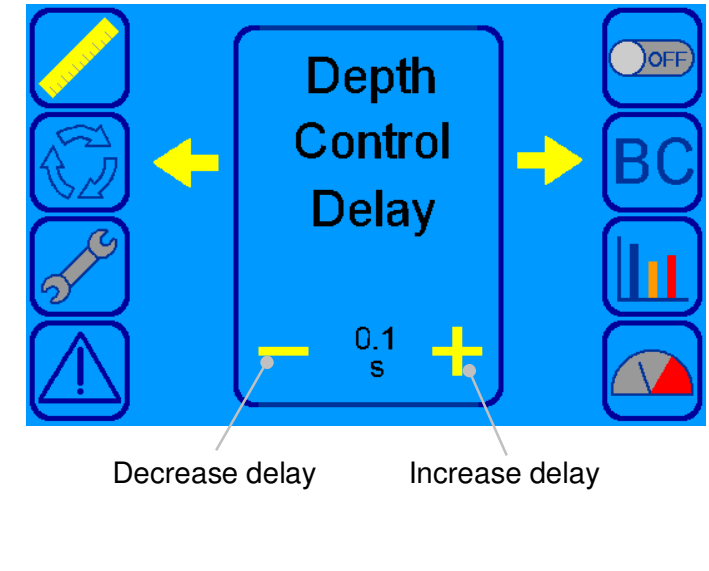


Fig 39

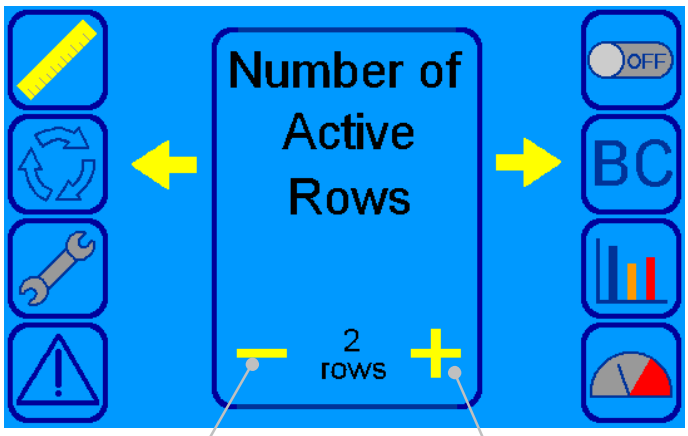


Fig 40

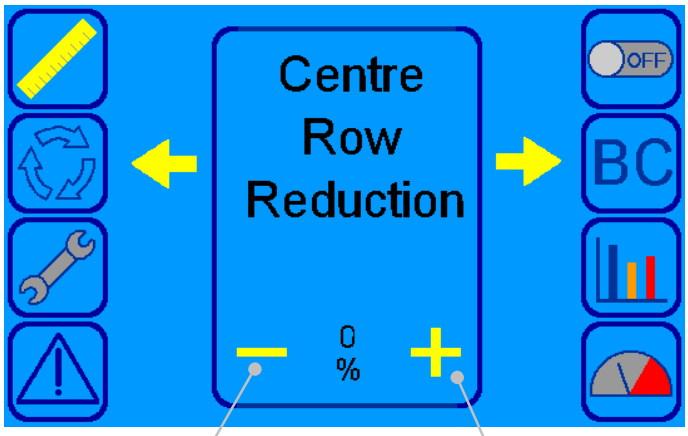


Fig 41

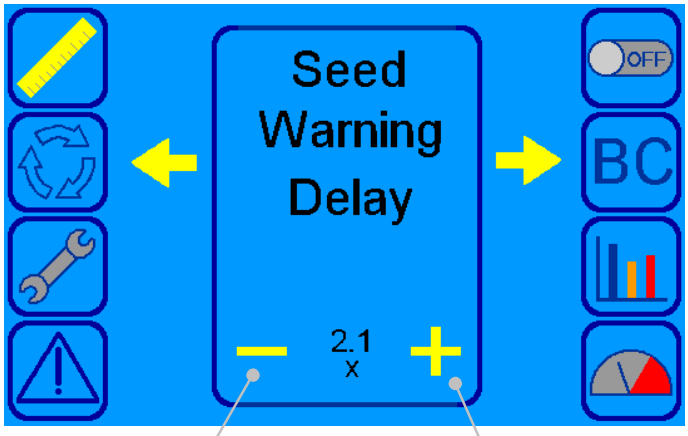


Fig 42

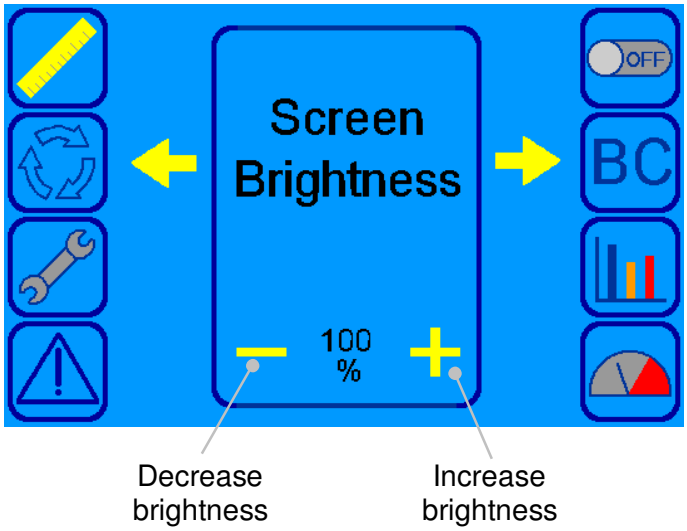

Screen
Brightness
100
%
OFF
BC
Decrease
brightness
Increase
brightness

Fig 43

Settings 2 (press for 3 seconds)

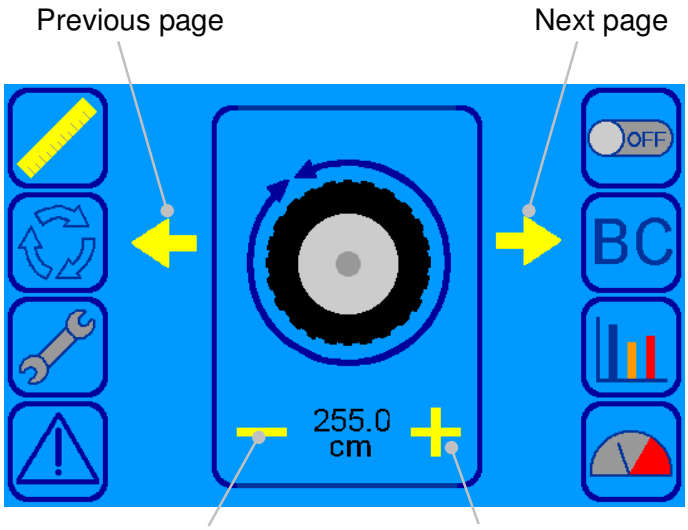


Fig 44

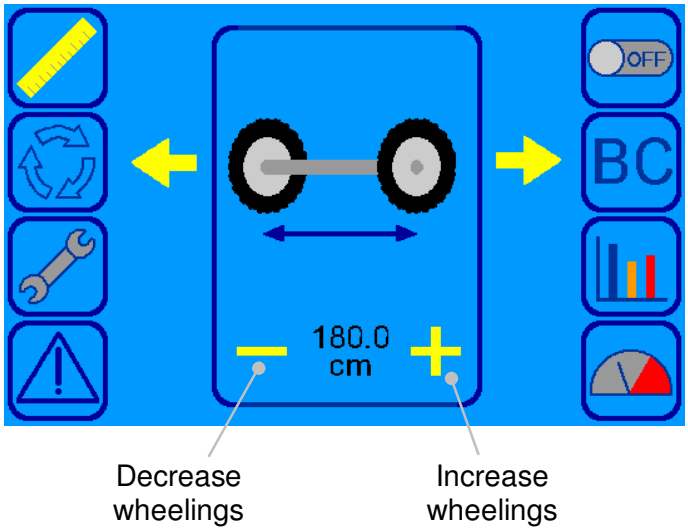


Fig 45

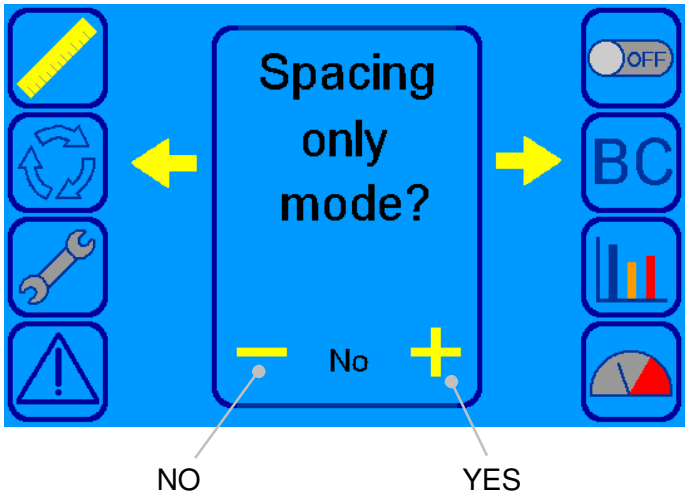


Fig 46

This function applies to SP SERIES planters only. Always set to NO.

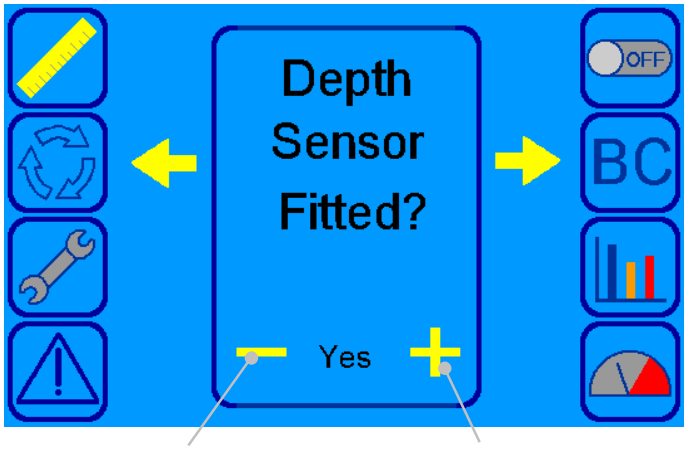


Fig 47

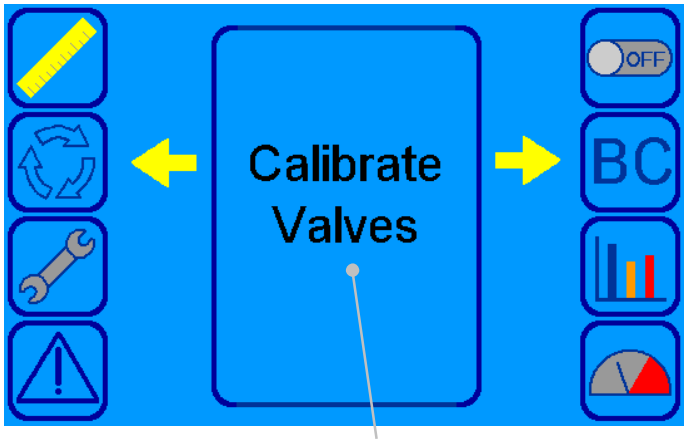


Fig 48

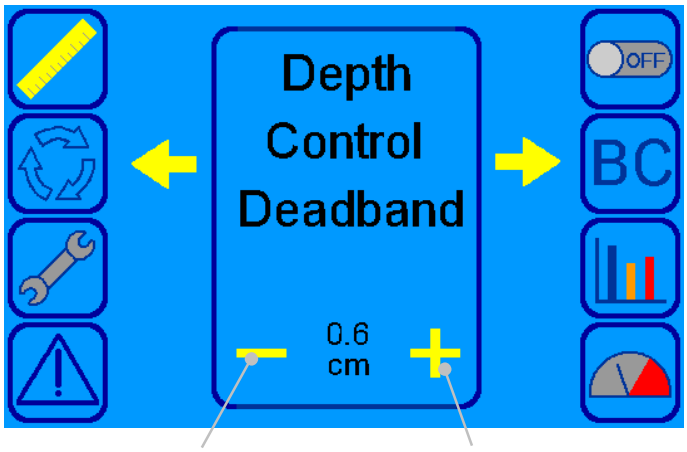


Fig 49

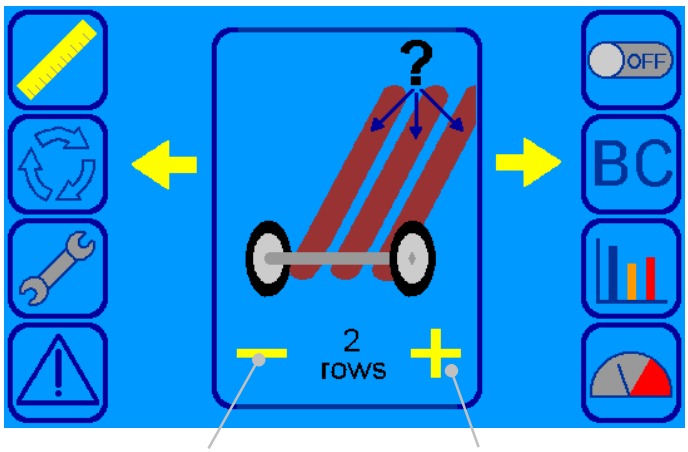

?
OFF
BC
2
rows
Decrease row configuration
Increase row configuration

Fig 50

Belt Control

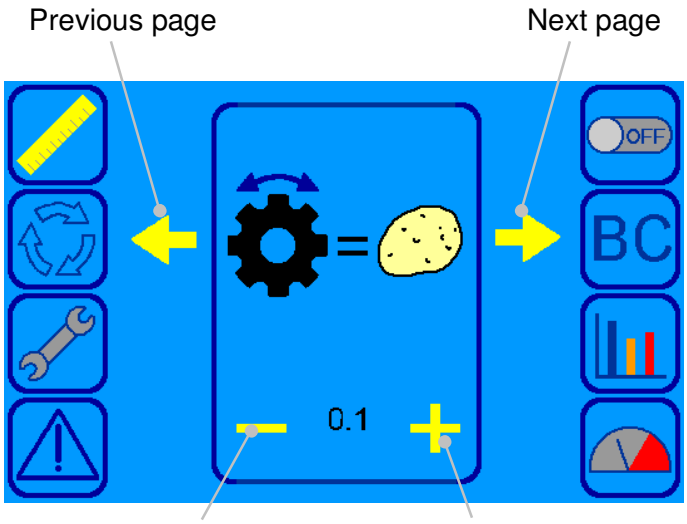


Fig 51

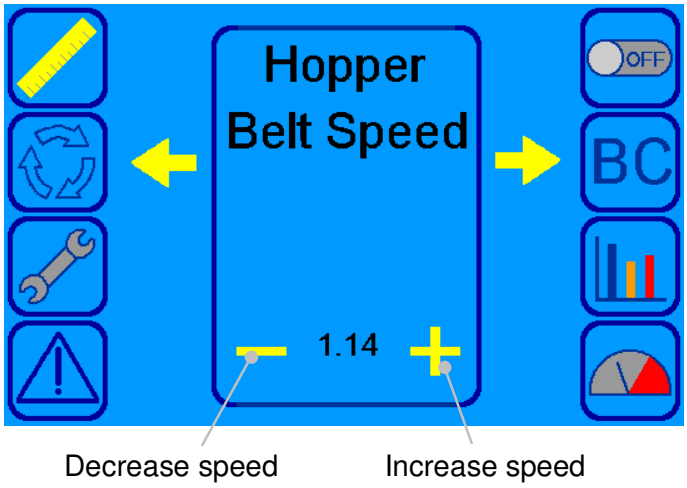


Fig 52

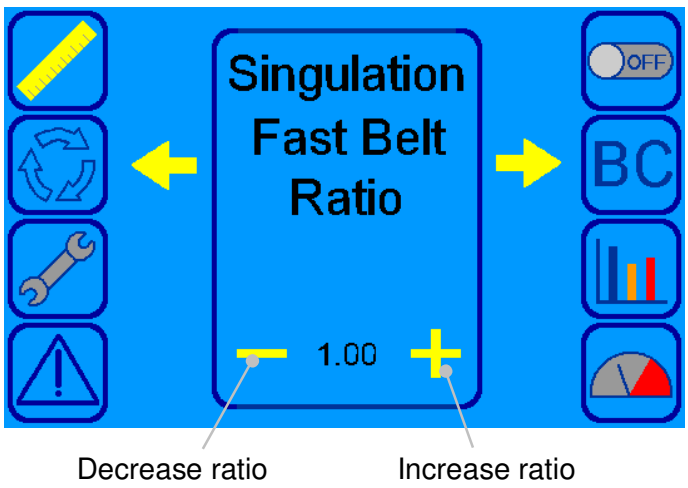


Fig 53

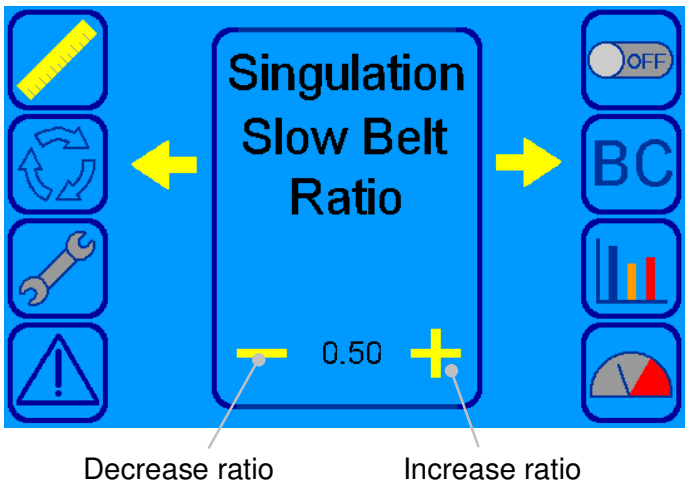


Fig 54

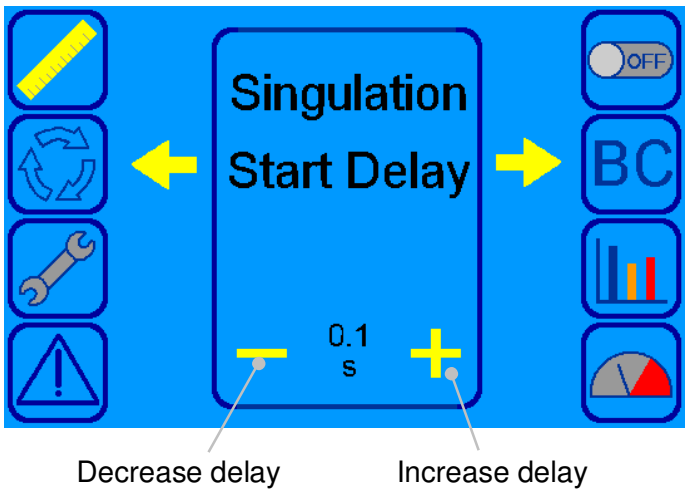


Fig 55

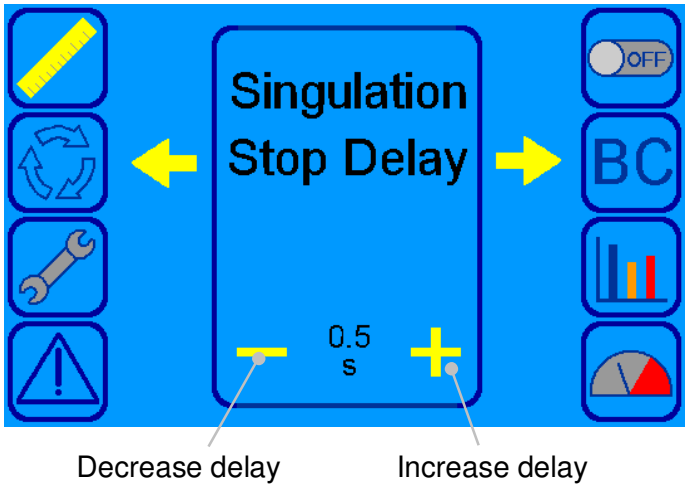


Fig 56

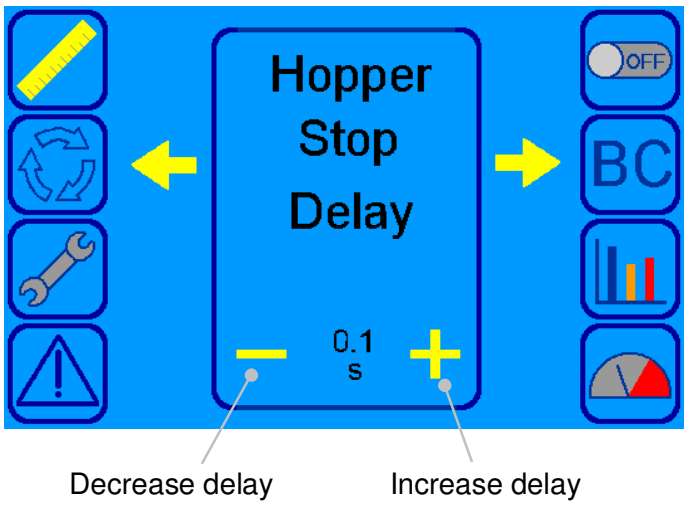


Fig 57

Diagnostics Screen

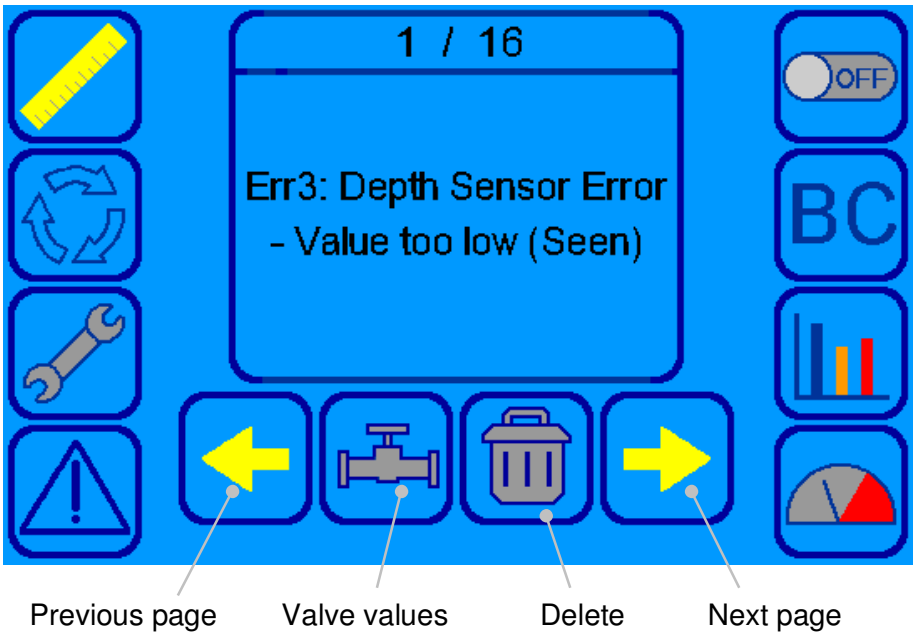


Fig 58

Statistics Screen

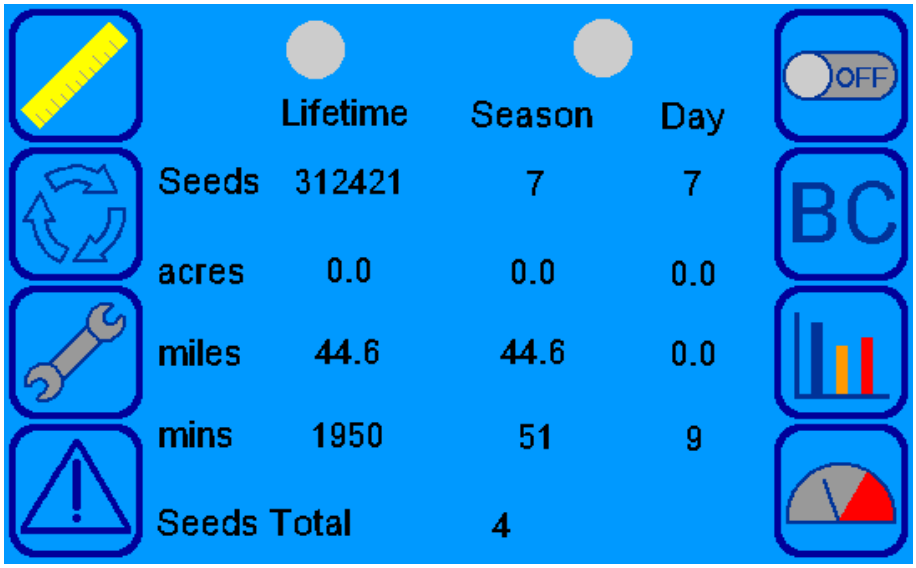
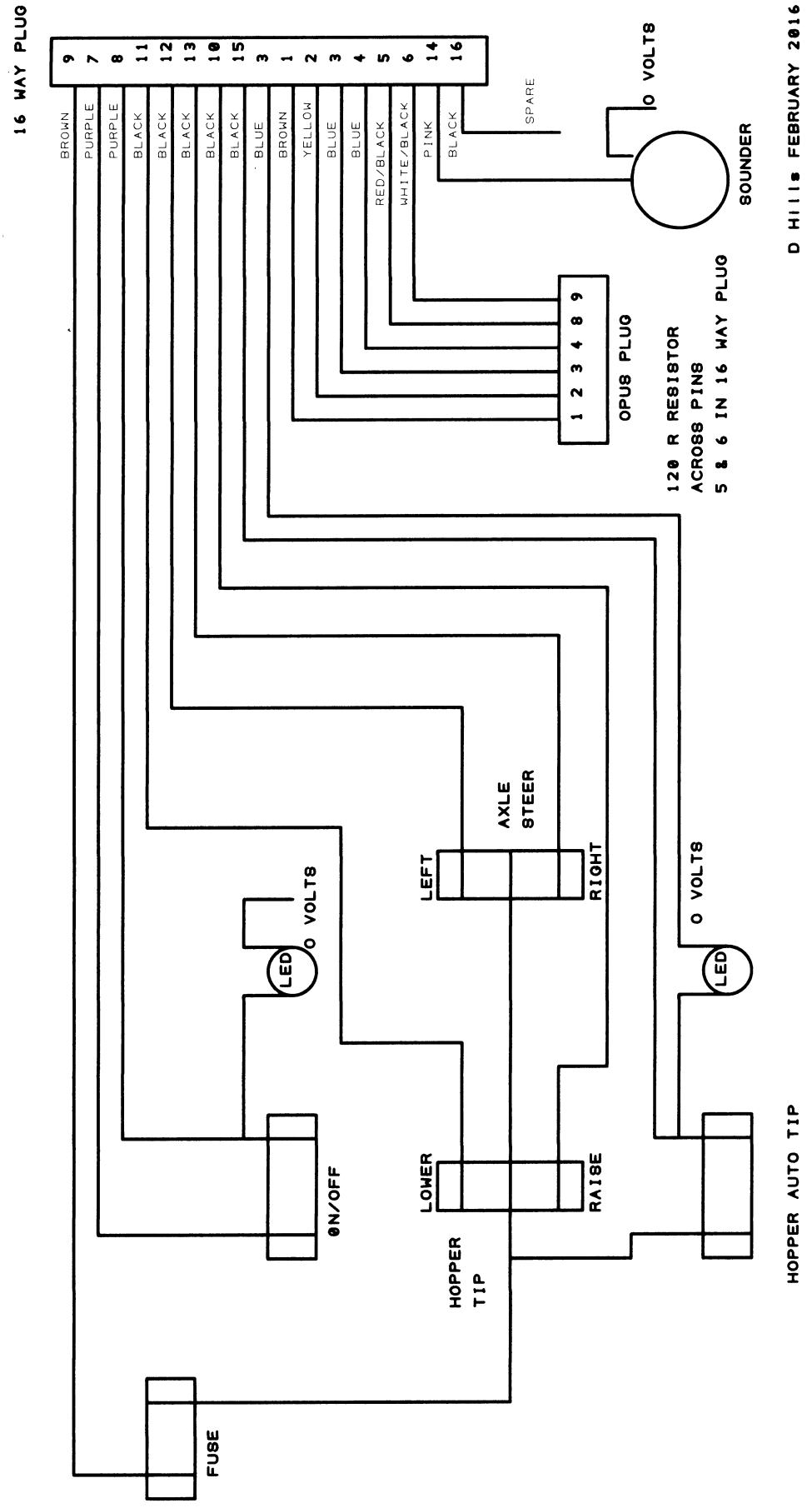


Fig 59

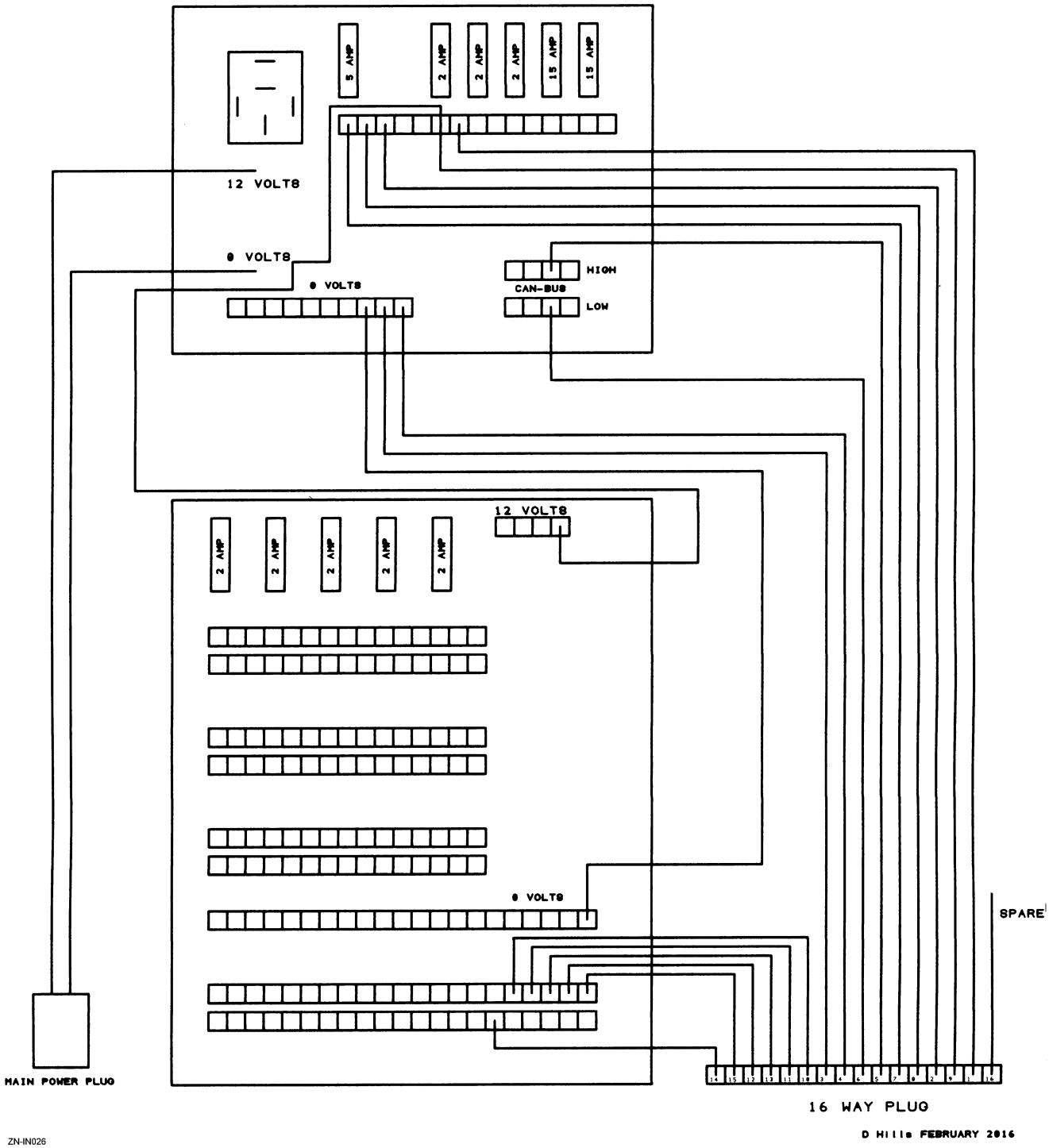
CONTENTS

ZENO DIAGRAMS

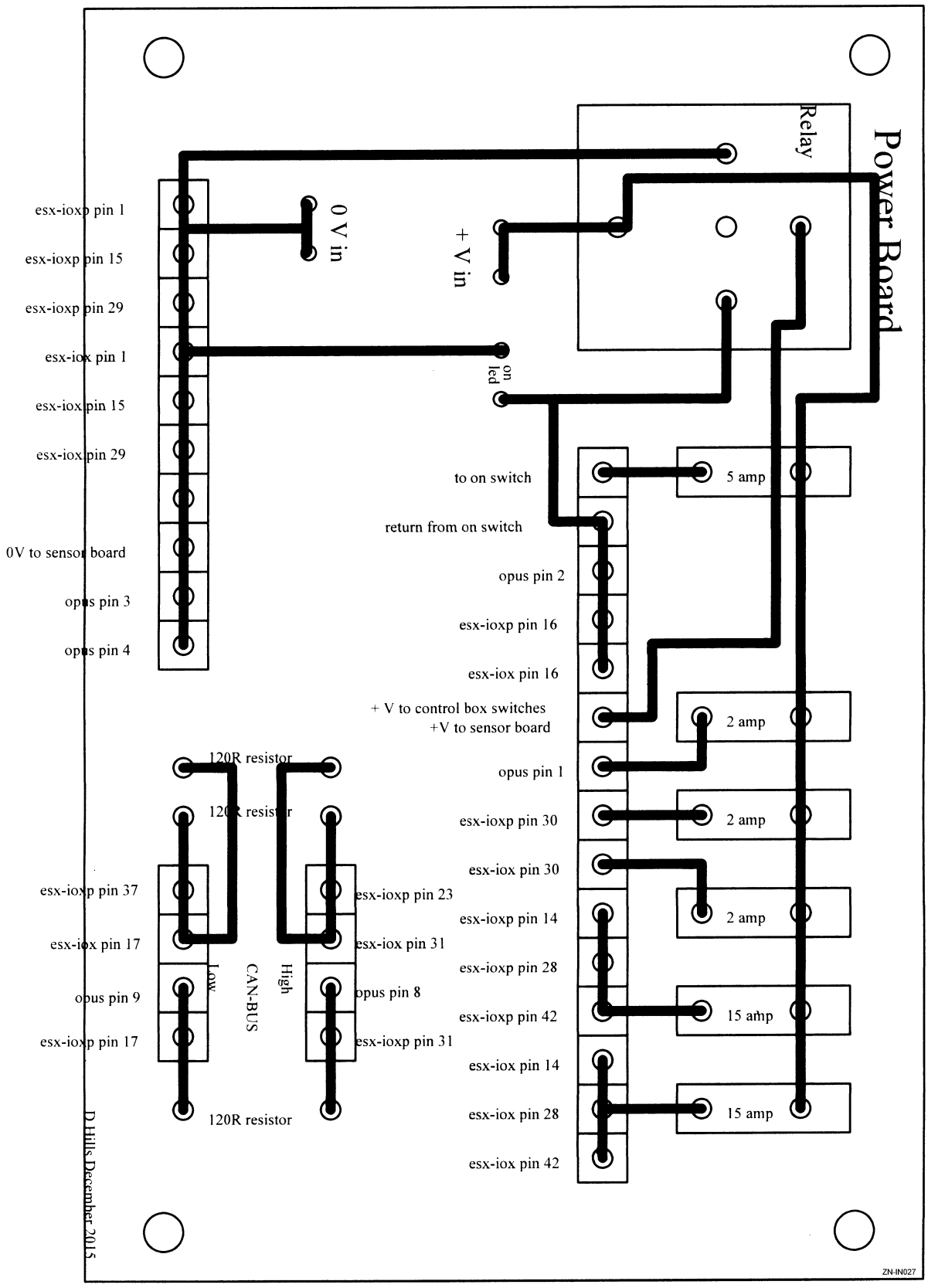
Control Box


16 WAY PLUG
9 7 8 11 12 13 10 15 3 1 2 3 4 5 6 14 16
BROWN
PURPLE
PURPLE
BLACK
BLACK
BLACK
BLACK
BLACK
BLUE
BROWN
YELLOW
BLUE
BLUE
RED/BLACK
WHITE/BLACK
PINK
BLACK
SPARE
0 VOLTS
SOUNDER
1 2 3 4 8 9
OPUS PLUG
120 R RESISTOR
ACROSS PINS
5 & 6 IN 16 WAY PLUG
D Hills FEBRUARY 2016
AXLE
STEER
LEFT
RIGHT
0 VOLTS
LED
0 VOLTS
LED
ON/OFF
LOWER
RAISE
HOPPER
TIP
HOPPER AUTO TIP
FUSE
ZN-IN025

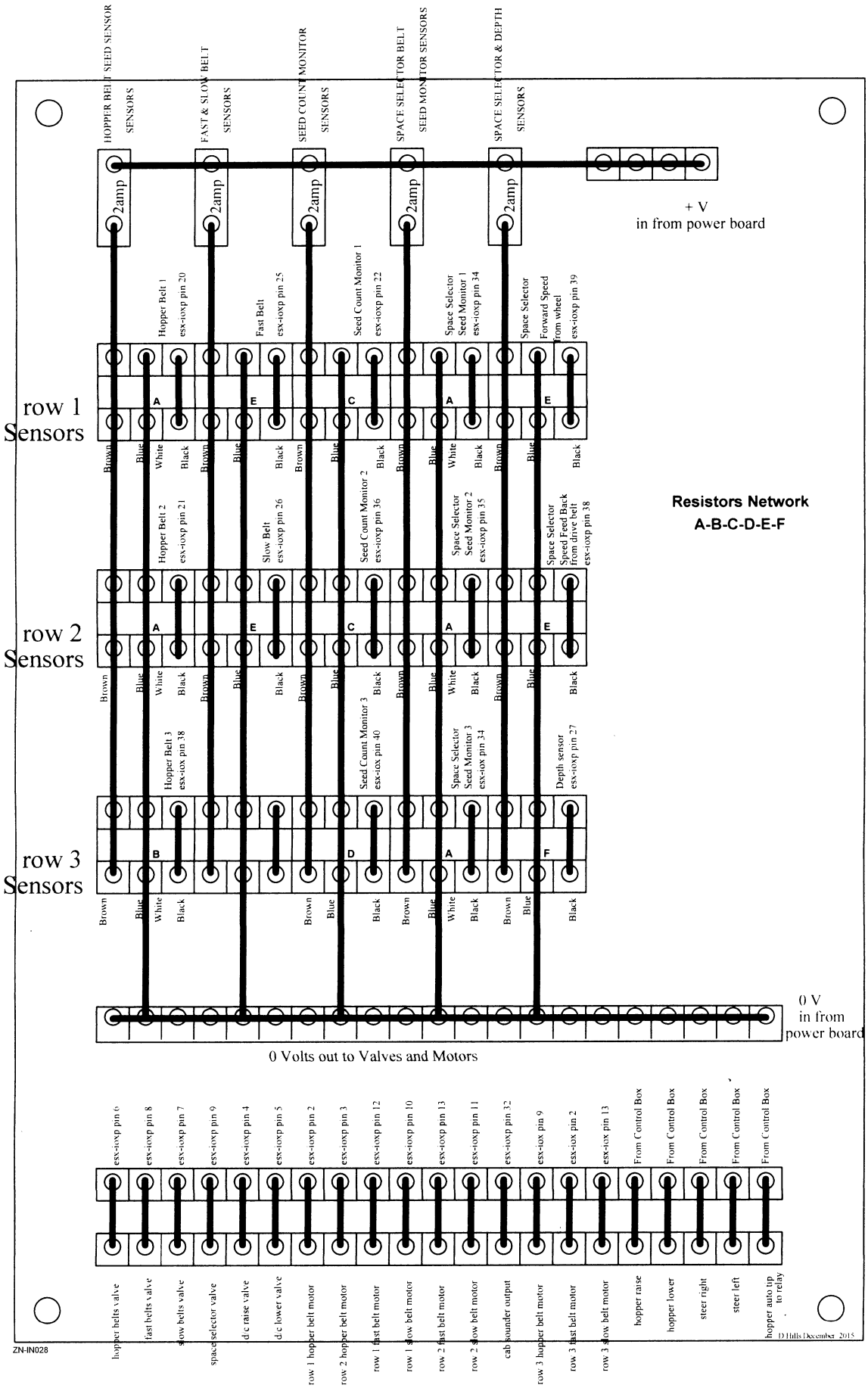
Distribution Box



Power Board


Power Board
Relay
esx-ioxp pin 1
esx-ioxp pin 15
esx-ioxp pin 29
esx-iox pin 1
esx-iox pin 15
esx-iox pin 29
0V to sensor board
opus pin 3
opus pin 4
0 V in
+ V in
on led
to on switch
return from on switch
opus pin 2
esx-ioxp pin 16
esx-iox pin 16
+ V to control box switches
+V to sensor board
opus pin 1
esx-ioxp pin 30
esx-iox pin 30
esx-ioxp pin 14
esx-ioxp pin 28
esx-ioxp pin 42
esx-iox pin 14
esx-iox pin 28
esx-iox pin 42
5 amp
2 amp
2 amp
2 amp
15 amp
15 amp
120R resistor
120R resistor
esx-ioxp pin 37
esx-iox pin 17
opus pin 9
esx-ioxp pin 17
Low
CAN-BUS
High
esx-ioxp pin 23
esx-iox pin 31
opus pin 8
esx-ioxp pin 31
120R resistor
D Hills December 2015
ZN-IN027

Sensor, Valve & Motor Board



16-pin Plug on Control Box and Distribution Box

16 PIN PLUG	CABLE	FUNCTION
1	BROWN	12 V TO OPUS PIN 1
2	YELLOW	IGNITION TO OPUS PIN 2
3	BLUE x 2	0 V TO OPUS PIN 3 also to leds and sounder
4	BLUE	0 V TO OPUS PIN 4
5	RED = BUS HIGH	CAN 1 HIGH TO OPUS PIN 8 (Red & Black in d/box)
6	BLUE = BUS LOW	CAN 1 LOW TO OPUS PIN 9 (White & Black in d/box)
7	VIOLET	12 V FROM POWER BOARD TO ON/OFF SWITCH IN C/BOX
8	VIOLET	12 V RETURN FROM ON/OFF SWITCH TO POWER BOARD
9	BROWN	12 V FROM POWER BOARD SENSOR OUTPUT TO HOPPER TIP AND STEER SWITCHES VIA FUSE IN C/BOX
10	BLACk	HOPPER RAISE
11	BLACk	HOPPER LOWER
12	BLACk	LEFT STEER
13	BLACk	RIGHT STEER
14	PINK	SOUNDER
15	BLACk	AUTO HOPPER TIP
16	BLACk	SPARE

ZH-N629

2-Row Configuration Wiring

OPUS A3			System				
1	Vcc	BATTERY POWER		Battery - fuse 2A (see diagram)			
2	D+	IGNITION		Ignition			
3	GND	Battery GND		GND			
4	CAR GND	Chassis GND		GND			
5	N/C	NOT CONNECTED		Not Used			
6	N/C	NOT CONNECTED		Not Used			
7	N/C	NOT CONNECTED		Not Used			
8	CAN 1 H	CAN Bus 1 Hi		To ESX-IOXp CAN Bus 1 Hi			
9	CAN 1 L	CAN Bus 1 Low		To ESX-IOXp CAN Bus 1 Low			
10	CAN 2 H	CAN Bus 2 Hi		Not Used			
11	CAN 2 L	CAN Bus 2 Low		Not Used			
12	USB +5V	USB		Not Used			
13	USB GND			Not Used			
14	USB D-			Not Used			
15	USB D+			Not Used			
16	RS232 Rx	RS232		Not Used			
17	RS232 Tx			Not Used			
18	RS232 GND			Not Used			
19	A/D IN 3	ANALOG / DIGITAL INPUTS		Not Used			
20	A/D IN 1			Not Used			
21	A/D IN 2			Not Used			
22	A/D IN 4			Not Used			
23	SERVICE ENABLE	SERVICE ENABLE INPUT		Not Used			
24	D OUT 3	DIGITAL OUTPUTS		Not Used			
25	D OUT 1			Not Used			
26	D OUT 2			Not Used			

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ESX - IOXp Option III Art 49862			System				
1	GND			GND	GND	GND	
2	OUT, RPM, DIN			Hopper Belt M	Motor Drive	Digital Output	Row 1
3	OUT, RPM, DIN			Hopper Belt M	Motor Drive	Digital Output	Row 2
4	OUT, RPM, DIN			Depth Control V	Raise Output	Digital Output	
5	OUT, DIN			Depth Control V	Lower Output	Digital Output	
6	OUT H/L, DIN, UIN			Hopper Belt V	Speed output	Current controled	
7	OUT H/L, DIN, UIN			Slow Belt V	Speed output	Current controled	
8	OUT H/L, DIN, UIN			Fast Belt V	Speed output	Current controled	
9	OUT H/L, DIN, UIN			Space Selector V	Speed output	Current controled	
10	OUT, PVG, DIN			Slow Belt M	Motor drive	Digital Output	Row 1
11	OUT, PVG, RPM, DIN			Slow Belt M	Motor drive	Digital Output	Row 2
12	OUT, PVG, RPM, DIN			Fast Belt M	Motor drive	Digital Output	Row 1
13	OUT, PVG, RPM, DIN	X_OUT_05 / X_IN_05		Fast Belt M	Motor drive	Digital Output	Row 2
14	UB			Battery - fuse 15A (see diagram)			
15	AGND			Analogue GND - GND for sensors			
16	D+			Ignition			
17	CAN1_L	X_CAN_BUS_01		CAN Bus LOW	To OPUS A3 CAN Bus 1 Low		
18	TxD	X_SER_01		NOT USED			
19	UB_OUT			NOT USED			
20	UIN, DIN	X_IN_22	5	Hopper Belt S	Feedback	Photoelectric Prox Switch	Row 1
21	UIN, DIN	X_IN_24	5	Hopper Belt S	Feedback	Photoelectric Prox Switch	Row 2
22	UIN, DIN	X_IN_26	7	Seed Monitor S	Feedback	Ultrasonic Sensor	Row 1
23	CAN2_H	X_CAN_BUS_02		CAN Bus Hi	To ESX-IOX CAN Bus Hi		
24	IIN NOT USED	X_IN_14	3	Hopper Belt NOT USED	Feedback	Inductive Prox Switch	
25	IIN	X_IN_16	4A	Fast Belt S	Feedback	Inductive Prox Switch	
26	IIN	X_IN_18	4	Slow Belt S	Feedback	Inductive Prox Switch	
27	IIN	X_IN_20	8	Deph Control S	Feedback	Ultrasonic Sensor	
28	UB			Battery - fuse 15A (see diagram)			
29	GND			GND			
30	UE			Battery - fuse 2A (see diagram)			
31	CAN1_H	X_CAN_BUS_01		CAN Bus Hi	To OPUS A3 CAN Bus 1 Hi		
32	10V+ SOUNDER OUT	X_SYS_SENSOR_SUPPLY_01		NOT USED SOUNDER OUT			
33	RxD	X_SER_01		NOT USED			
34	UIN, DIN	X_IN_21	6	Singulating Belts S	Feedback	Photoelectric Prox Switch	Row 1
35	UIN, DIN	X_IN_23	6	Singulating Belts S	Feedback	Photoelectric Prox Switch	Row 2
36	UIN, DIN	X_IN_25	7	Seed Monitor S	Feedback	Ultrasonic Sensor	Row 2
37	CAN2_L	X_CAN_BUS_02		CAN Bus LOW	To ESX-IOX CAN Bus Lo		
38	IIN	X_IN_13	2	Space selector S	Feedback	Inductive Prox Switch	
39	IIN	X_IN_15	1	Space selector S	Forward speed Feedback	Inductive Prox Switch	
40	IIN	X_IN_17		NOT USED			
41	IIN	X_IN_19		NOT USED			
42	UB			Battery - fuse 15A (see diagram)			

3-Row Configuration Wiring

OPUS A3			System			
1	Vcc	BATTERY POWER	Battery - fuse 2A (see diagram)			
2	D+	IGNITION	Ignition			
3	GND	Battery GND	GND			
4	CAR GND	Chassis GND	GND			
5	N/C	NOT CONNECTED	Not Used			
6	N/C	NOT CONNECTED	Not Used			
7	N/C	NOT CONNECTED	Not Used			
8	CAN 1 H	CAN Bus 1 Hi	To ESX-IOXp CAN Bus 1 Hi			
9	CAN 1 L	CAN Bus 1 Low	To ESX-IOXp CAN Bus 1 Low			
10	CAN 2 H	CAN Bus 2 Hi	Not Used			
11	CAN 2 L	CAN Bus 2 Low	Not Used			
12	USB +5V	USB	Not Used			
13	USB GND		Not Used			
14	USB D-		Not Used			
15	USB D+		Not Used			
16	RS232 Rx	RS232	Not Used			
17	RS232 Tx		Not Used			
18	RS232 GND		Not Used			
19	A/D IN 3	ANALOG / DIGITAL INPUTS	Not Used			
20	A/D IN 1		Not Used			
21	A/D IN 2		Not Used			
22	A/D IN 4		Not Used			
23	SERVICE ENABLE	SERVICE ENABLE INPUT	Not Used			
24	D OUT 3	DIGITAL OUTPUTS	Not Used			
25	D OUT 1		Not Used			
26	D OUT 2		Not Used			

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ESX - IOXp Option III Art 49862			System				
1	GND		GND		GND	GND	
2	OUT, RPM, DIN		Hopper Belt		Motor Drive	Digital Output	Row 1
3	OUT, RPM, DIN		Hopper Belt		Motor Drive	Digital Output	Row 2
4	OUT, RPM, DIN		Depth Control		Raise Output	Digital Output	
5	OUT, DIN		Depth Control		Lower Output	Digital Output	
6	OUT H/L, DIN, UIN		Hopper Belt		Speed output	Current controled	
7	OUT H/L, DIN, UIN		Slow Belt		Speed output	Current controled	
8	OUT H/L, DIN, UIN		Fast Belt		Speed output	Current controled	
9	OUT H/L, DIN, UIN		Space Selector		Speed output	Current controled	
10	OUT, PVG, DIN		Slow Belt		Motor drive	Digital Output	Row 1
11	OUT, PVG, RPM, DIN		Slow Belt		Motor drive	Digital Output	Row 2
12	OUT, PVG, RPM, DIN		Fast Belt		Motor drive	Digital Output	Row 1
13	OUT, PVG, RPM, DIN	X_OUT_05 / X_IN_05	Fast Belt		Motor drive	Digital Output	Row 2
14	UB		Battery - fuse 15A (see diagram)				
15	AGND		Analogue GND - GND for sensors				
16	D+		Ignition				
17	CAN1_L	X_CAN_BUS_01	CAN Bus LOW		To OPUS A3 CAN Bus 1 Low		
18	TxD	X_SER_01	NOT USED				
19	UB_OUT		NOT USED				
20	UIN, DIN	X_IN_22	5 Hopper Belt		Feedback	Photoelectric Prox Switch	Row 1
21	UIN, DIN	X_IN_24	5 Hopper Belt		Feedback	Photoelectric Prox Switch	Row 2
22	UIN, DIN	X_IN_26	7 Seed Monitor		Feedback	Ultrasonic Sensor	Row 1
23	CAN2_H	X_CAN_BUS_02	CAN Bus Hi		To ESX-IOX CAN Bus Hi		
24	UIN	X_IN_14 NOT USED	3 Hopper Belt	NOT USED	Feedback	Inductive Prox Switch	
25	IIN	X_IN_16	4A Fast Belt		Feedback	Inductive Prox Switch	
26	IIN	X_IN_18	4 Slow Belt		Feedback	Inductive Prox Switch	
27	IIN	X_IN_20	8 Depth Control		Feedback	Ultrasonic Sensor	
28	UB		Battery - fuse 15A (see diagram)				
29	GND		GND				
30	UE		Battery - fuse 2A (see diagram)				
31	CAN1_H	X_CAN_BUS_01	CAN Bus Hi		To OPUS A3 CAN Bus 1 Hi		
32	10V+ SOUNDER OUT	X_SYS_SENSOR_SUPPLY_01	NOT USED	SOUNDER OUT			
33	RxD	X_SER_01	NOT USED				
34	UIN, DIN	X_IN_21	6 Singulating Belts		Feedback	Photoelectric Prox Switch	Row 1
35	UIN, DIN	X_IN_23	6 Singulating Belts		Feedback	Photoelectric Prox Switch	Row 2
36	UIN, DIN	X_IN_25	7 Seed Monitor		Feedback	Ultrasonic Sensor	Row 2
37	CAN2_L	X_CAN_BUS_02	CAN Bus LOW		To ESX-IOX CAN Bus Lo		
38	IIN	X_IN_13	2 Space selector		Feedback	Inductive Prox Switch	
39	IIN	X_IN_15	1 Space selector		Forward speed Feedback	Inductive Prox Switch	
40	IIN	X_IN_17	NOT USED				
41	IIN	X_IN_19	NOT USED				
42	UB		Battery - fuse 15A (see diagram)				

ESX - IOX Option IV Art 34460			System				
1	GND			GND			
2	OUT9			Fast Belt M	Motor drive	Digital Output	Row 3
3	OUT10			NOT USED			
4	OUT11			NOT USED			
5	OUT12			NOT USED			
6	OUT4 (PWM, LS)			NOT USED			
7	OUT3 (PWM, LS)			NOT USED			
8	OUT2 (PWM, LS)			NOT USED			
9	OUT1 (PWM, LS)			Hopper Belt M	Motor Drive	Digital Output	Row 3
10	OUT8			NOT USED			
11	OUT7			NOT USED			
12	OUT6			NOT USED			
13	OUT5			Slow Belt M	Motor drive	Digital Output	Row 3
14	UB			Battery - fuse 15A (see diagram)			
15	AGND			Analogue GND GND for sensors			
16	D+			Ignition			
17	CAN_L			CAN Bus LOW	To ESX-IOXp CAN Bus 2 Lo		
18	RPM2, DIN28			NOT USED			
19	UB_OUT			NOT USED			
20	UIN2, DIN10		6	NOT USED			
21	UIN4, DIN12		6	NOT USED			
22	UIN6, DIN14			NOT USED			
23	CAN_H_OUT			NOT USED			
24	IIN2, DIN2		5	NOT USED			
25	IIN4, DIN4		5	NOT USED			
26	IIN6, DIN6		7	NOT USED			
27	IIN8, DIN8		7	NOT USED			
28	UB			Battery - fuse 15A (see diagram)			
29	GND			GND			
30	UE			Battery - fuse 2A (see diagram)			
31	CAN_H			CAN Bus Hi	To ESX-IOXp CAN Bus 2 Hi		
32	+10V (switchable)			NOT USED			
33	RPM1, DIN27			NOT USED			
34	UIN1, DIN9		6	Singulating Belts S	Feedback	Photoelectric Prox Switch	Row 3
35	UIN3, DIN11		6	NOT USED			
36	UIN5, DIN13			NOT USED			
37	CAN_L_OUT			NOT USED			
38	IIN1, DIN1		5	Hopper Belt S	Feedback	Photoelectric Prox Switch	Row 3
39	IIN3, DIN3		5	NOT USED			
40	IIN5, DIN5		7	Seed Monitor S	Feedback	Ultrasonic Sensor	Row 3
41	IIN7, DIN7		7	NOT USED			
42	UB			Battery fuse 15A (see diagram)			

ZN-IN032

2-Row and 3-Row Hydraulic Circuit